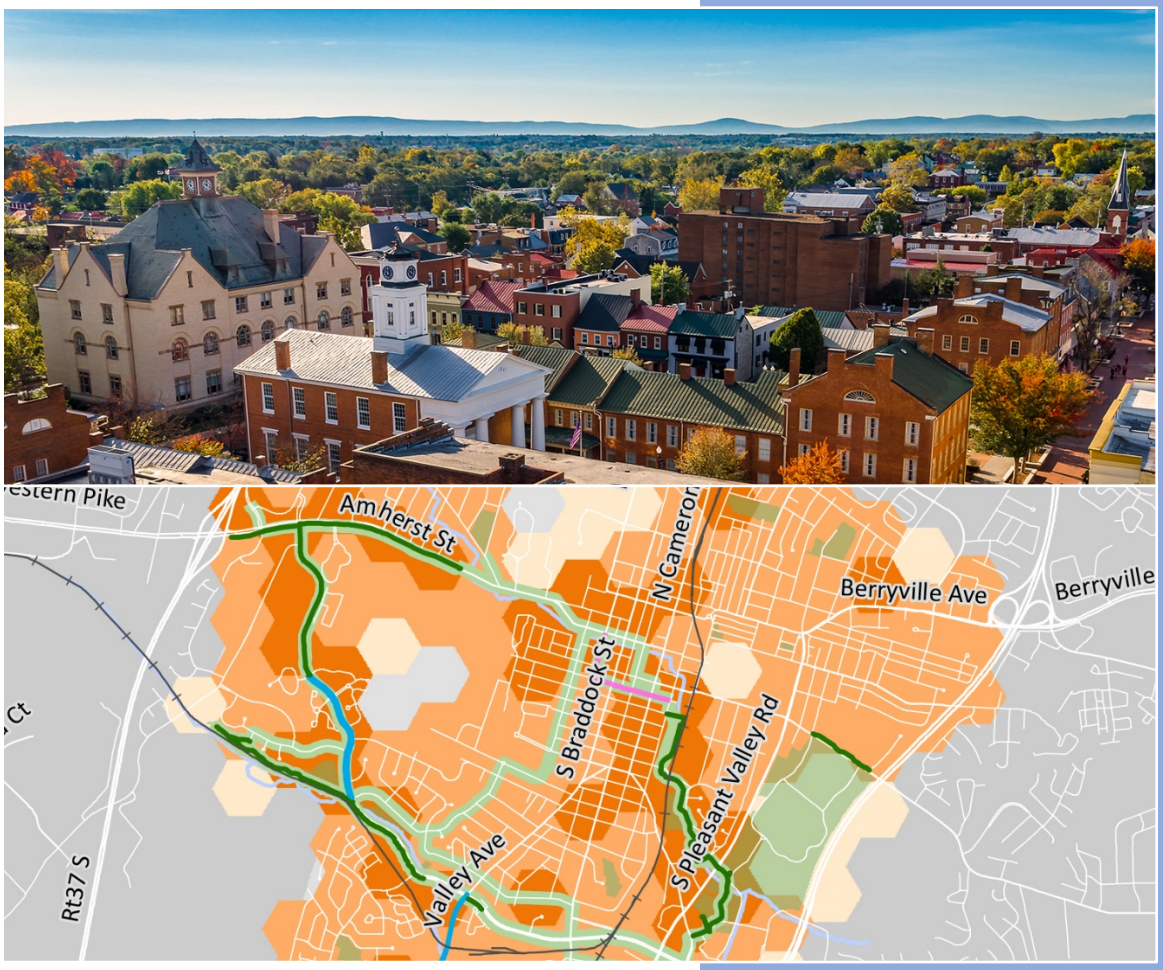
September 2020

Winchester Bike Share Study



WINFRED METROPOLITAN PLANNING ORGANIZATION

Winchester Virginia

EPRPC

Photo by City of Winchester

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Introduction

The Winchester Bike Share Study is a project of the WinFred Metropolitan Planning Organization (MPO) undertaken on behalf of the City Winchester, Virginia. The MPO contracted with EPR, P.C. to study the feasibility of bike share in Winchester and develop a bike share plan with a phased approach for implementation. The City of Winchester and the WinFred MPO identified a set of goals for the project and oversaw the work of EPR, P.C.

Project Goals

The goals of the Winchester Bike Share Study are to:

- Develop a comprehensive logistical plan for a potential bike share system,
- Develop options for a phased implementation strategy,
- Analyze potential impacts of bike sharing to Winchester,
- Identify key stakeholders and potential partners within the community, and
- Inventory existing bike facilities and identify potential bike network enhancements.

Study Process

The project was broken down into several core tasks that all support development of the bike share plan presented in this report.

Peer City Research

EPR, P.C. selected three localities that are comparable to Winchester and have established bike share programs, conducted research into these programs, and interviewed key staff at these localities. Consultants used this research to establish best practices for implementing bike share in small cities like Winchester. A summary of findings from peer city research is provided beginning on page 9.

Stakeholder Outreach

MPO and Winchester City staff identified key community stakeholders and potential partners to be consulted regarding a potential bike share program. The study team conducted a round of stakeholder, small group interviews to present information about bike share and solicit feedback about potential challenges and opportunities of implementing bike share in Winchester. A summary of the stakeholder outreach is provided beginning on page 16.

Bike Network Inventory and Recommendations

EPR, P.C. created a map of all existing bike facilities in Winchester as well as the potential corridors prioritized by the region's bicycle and pedestrian plan. The study team developed a set of recommendations for policies and projects that would increase bike connectivity and support the success of a bike share program in Winchester. The bike network recommendations are summarized beginning on page 21.

System Planning

EPR, P.C. developed a bike share system plan for Winchester, relying on information learned from peer cities and stakeholders. A suitability analysis guided the system plan using a variety of spatial data sources to identify areas of Winchester that are ideally suited for bike share. EPR, P.C. also conducted an equity analysis to evaluate the proposed system's impact on populations that are historically underrepresented

in transportation planning processes. The system plan includes a cost estimate that is based on actual costs of recent bike share systems in regions like Winchester. The system plan begins on page 30 of this report.

What is Bike Share?

Bike share programs offer short-term bicycle rentals at unattended stations. Users can pick a bike from one station and return it to any other station in the system. Systems typically encourage use for one-way trips and are intended to maximize the availability of bikes for other users. Bike share programs provide a variety of pricing options, including daily, monthly, and annual memberships as well as pay-per-ride options. Bike share programs can be run by local governments, public authorities, non-profit organizations, and even private companies.

The first large-scale, modern bike share program was introduced in Paris under the name "Velib" in 2007. In America, bike share programs have become increasingly popular with 45.5 million rides taken in 2018 alone.[1] Bike share programs provide an affordable, sustainable, and healthy mode of transportation in urban areas and can promote economic development and tourism. With the advent of new technology, the bike share landscape continues to rapidly change.

In America, bike share programs have become increasingly popular with 45.5 million rides taken in 2018 alone

Technology

There are two core components of a bike share system: bikes and a locking system that allows users to access and lock system bikes. Bike share systems in large cities typically use a dock-based locking system where the locking mechanism is in fixed docks. Dock-less "Smart lock" bikes have the locking mechanism built into the bike, eliminating the need for fixed docks and allowing greater flexibility in system planning. There are significant differences in cost between dock-based and smart bike systems. Smart bikes do not require the installation of docks, but each bike is equipped with a locking mechanism and network capabilities, making the bikes more expensive. However, the relatively high cost of docks makes smart lock systems, in comparison, considerably cheaper for smaller systems. Although costs vary significantly by region, conventional bike share bikes cost around $1,000 and electric bikes approximately $2,000. Docks add approximately $4,000 per bike to system start-up costs. Larger cities such as Paris, New York, Chicago, Washington, D.C., and

Larger cities such as Paris, New York, Chicago, Washington, D.C., and Richmond tend to favor docked-based systems while smaller systems such as Norfolk, Blacksburg, and Danville typically use dock-less smart bikes, likely due to their lower cost and higher flexibility

[1] Shared Micromobility in the U.S.: 2018, National Association of City Transportation Officials, https://nacto.org/shared-micromobility-2018/

Richmond tend to favor docked-based systems while smaller systems such as Norfolk, Blacksburg, and Danville typically use dock-less smart bikes, likely due to their lower cost and higher flexibility.

FIGURE 1 COMPARISON OF DOCK-BASED AND DOCK-LESS BIKE SHARE TECHNOLOGIES

Dock-Based Bike Share

Photo by Tony Webster

- Unlocking mechanism located on fixed docks
- Payment accepted at kiosks located on docking stations, online, or through mobile app
- Bikes must be returned to docks
- Docking stations can be located on sidewalks or streets but require adequate space and careful planning
- Docking stations require electricity to function but can be solar powered, eliminating need for a hard wired connection
- Docking stations represent a significant capital expense
- Bikes are simple, relatively cheap due to lack of locking mechanism and GPS features

Dock-less Bike Share

Photo by Social Bicycles

- Locking mechanism located on bikes
- Payments accepted online or through mobile app
- Bike share operator can determine bike return location (normal racks, special racks, geofenced zone, etc.)
- GPS on bikes deters theft, vandalism
- Many dockless systems require users to use mobile apps to unlock bikes due to lack of fixed payment kiosks
- Bikes can be locked at standard racks, removing need for large, expensive docking stations
- Easier to site bike share locations than docked station
- Bikes are more expensive than dock-based bikes because locking mechanism and electronics are located on bike

Most bike share systems provide an app that allows users to purchase rides and the bikes to be unlocked from a smart phone. While this option is appealing to many, it can be challenging for some members of the community who may not have access to smart phones. Bike share apps require users to create an account with the system and provide credit or debit card information to cover the cost of rides and provide a security deposit to deter theft and vandalism. When the user is ready to unlock a bike, the app either generates an unlock code to be entered into a keypad on the bike or it communicates with the bike wirelessly to unlock it. The rider is then able to ride the bike which must be returned and locked to a designated station or area. Mid-ride stops, or "hold" features, are allowed for short periods of time. There is some variation in these steps depending on the program, but most bike share systems follow a similar process.

User Fees and Memberships

Riders typically purchase rides by the hour or day or with a longer-term monthly or annual membership. An annual membership typically costs users between $50 and $100 while a 24-hour pass is between $6 and $10. Should the rider be in possession of the bike longer than their designated purchase, (s)he is charged an additional fee. In large cities where driving is difficult, 24-hour passes, and tourist passes generate significant revenue for bike share operators. Tourist sites provide an opportunity to increase bike share use and revenue, but easy automobile access to popular visitor destinations reduces this effect.

Station and Bike Placement

The placement of docking stations or hubs largely depends on the vision and goals for the bike share program. In larger cities, docks are densely spaced, as it is used to transport residents to work or help tourists navigate the city. In smaller, more dispersed areas, the system may be designed for recreational purposes or to provide options to visit local points of interest. These types of systems may use fewer stations located at trail entrances. When creating and designating specific station locations, a few principles should be kept in mind to ensure that stations are:

- In highly visible locations
- Located so as not to impede pedestrian travel and,
- Located in relatively close proximity to each other

Pairing effective system design with protected bike lanes will increase ridership and help users feel more comfortable using the system.

Benefits of Bike Share

Bike share provides a variety of benefits to individual users, local governments, and broader society. Some benefits of bike share are easier to quantify than others. The following section draws from available research to summarize the benefits of bike share to mobility, health and wellness, equity, environmental sustainability, cities, and economic sustainability.

Mobility

Bike Share systems provide several benefits to riders including affordable mobility and connectivity, increased transportation options, and positive health benefits. Bike share has helped increase mobility and connectivity in thousands of communities across the county and given people greater flexibility to reach their destinations. Bike share allows both residents and tourists to use bikes on an as needed basis without the cost and responsibility associated with ownership, increasing access to those who might not otherwise ride. The implementation of bike share can make a statement in a community, showing that bikes belong on local streets. This visual reinforcement makes people more comfortable when riding bikes and encourages others to use the system. When compared to the cost of owning and operating a personal vehicle, bike share membership and use is relatively inexpensive and widely accessible.

The implementation of bike share can make a statement in a community, showing that bikes belong on local streets

Additionally, bike share systems provide greater transportation options. Systems can address "First and Last Mile Connection," issues which address the beginning and end of an individual trip made primarily by public transportation. Commonly, people are willing to walk to transit stops that are in convenient locations, but the origin or destination may be difficult or impossible for some to reach in a short walk. Bike share can provide an option for those who would otherwise be unable to access public transportation and helps alleviate the first and last mile issue.

Health and Wellness

Aside from travel uses, bike share systems offer health benefits to the community. Health benefits of bicycling are well known in helping address preventable diseases such as obesity, heart disease, and diabetes.[2] Bike share systems allow communities to offer the public options for health and exercise with relatively low user costs. Statistics have shown that bicycling 30 minutes a day decreases the risk of heart disease by 82%.[3]

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Besides the physical health benefits, bicycling can also improve mental health. Exercise is proven to improve outlook, increase recreation and socialization, and reduce stress.[4] Cycling to and from work can lead to a more productive workday since the exercise is done in association with work as opposed to exercise done during leisure time. Inactivity and the health issues associated with it has been shown to bring significant costs in developed countries.[5] Cycling is a recommended means of physical exercise which provides benefits to the individual, but also contributes to improving public health and reducing expenditure on healthcare.

Equity

Bike share provides low-cost mobility options to individuals who cannot afford to purchase a car. According to Census data, 9% of Winchester households do not have access to a motor vehicle. Bicycling is a relatively affordable means of transportation but requires individuals to purchase and maintain a bike. According to AAA, the annual cost of vehicle ownership in 2019 was $9,282[6] while Bike share membership fees typically range from $50 to $120 per year. Blacksburg's bike share system, ROAM New River Valley, offers

According to census data, 9% of Winchester households do not have access to a motor vehicle.

[2] The Finnish Diabetes Prevention Study – Lifestyle intervention and 3-year results on diet and physical activity. Retrieved from http://care.diabetesjournals.org/content/26/12/3230.full on May 28, 2020.
[3] British Medical Association (1992). Cycling Towards Health and Safety. Oxford University Press.
[4] Bike Sharing in the United States: State of the Practice and Guide to Implementation. Federal Highway Administration. United States Department of Transportation.
[5] Inadequate Physical Activity and Health Care Expendatures in the United States. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4604440/ on June 24, 2020.
[6] Your Driving Costs, AAA, https://newsroom.aaa.com/auto/your-driving-costs/

an annual pass for $60. Bike share would lower barriers to biking and give residents an opportunity to try biking without a significant financial commitment.

Environmental Sustainability

Bike share can help reduce greenhouse gas emissions by replacing trips that would have otherwise occurred by automobile. This benefit can be amplified when used in combination with public transit. Many bike share users report using their personal vehicle less when presented with the option to use bike share – the system inspired them to walk more, take transit or car pool more frequently than they did prior to the implementation of the bike share system.[7] In addition to environmental benefits, there is also the potential that a bike share system could reduce automobile trips on some city streets. And reduced traffic makes for a reinforcing feedback loop by making streets in turn safer and more comfortable for biking and walking.

This shows that bike share can reduce the reliance on private vehicle use in cities, as most research shows that 5-25% of bike share trips in North America replace motor vehicle trips.[8]

City Benefits

The cost of implementing a bike share system is relatively low compared to the cost of other transportation investments available to localities. For example, purchasing buses or expanding roadway capacity require significant financial resources as well as long implementation timelines. Bike share can be relatively inexpensive and quick to implement because it relies on existing infrastructure, including roadways and sidewalks.[9]

Bike share also has the potential to enhance the city's image. These systems can become an attraction for residents and tourists to use recreationally and for transport and can generate positive local and regional exposure that would otherwise be difficult or expensive to generate. Bike share systems enhance a locality's multi-modal system and contribute to its competitiveness.

Localities increasingly invest in multi-modal transportation to compete for residents and jobs. bike share systems enhance a locality's multi-modal system and contribute to its competitiveness.

Bike share can also maximize the benefits provided by existing bicycle and trail infrastructure. Adding bike share stations at trail heads allows for quick and simple access by bike and has the potential to increase trail use. Minimizing barriers to trail access can increase trail usage.

[7] Risks and Benefits of Bikeshare – Wilmington, DE. Retrieved from https://www.wilmingtonde.gov/home/showdocument?id=574 on May 28, 2020.
[8] St. Louis Bike Share Feasibility Study Final Report. Retrieved from http://docshare.tips/st-louis-bike-share-feasibility-study-final-report_590f6406ee3435b234994435.html on May 28, 2020.
[9] Risks and Benefits of Bikeshare – Wilmington, DE. Retrieved from https://www.wilmingtonde.gov/home/showdocument?id=574 on May 28, 2020.

Economic Development

In our stakeholder interviews, participants frequently mentioned that Winchester is a compact, tight knit city. This is an advantage in the implementation of a bike share system because bike share stations attract customers to nearby businesses and bike share users are more likely to spend money within four blocks of a bike share station.[10] Bike share systems also tend to have a positive effect on business activity due to increased accessibility within local neighborhoods. Bike share users have been shown to engage in new spending at neighborhood businesses because of the access provided to them by bike share.[11]

Additionally, more efficient commuting through the use of bike share can make the workforce more productive. Research frequently points to bike share as a critical piece of the urban transportation puzzle, not a stand-alone approach.[12] Adding this new service can lead to a greater participation in the labor force of the city because through making jobs more accessible to a wider population. Bike share also embraces new technology such as social media and is part of the new sharing economy, all of which are attractive characteristics to younger demographics and professionals for locating in a city.

Peer City Experience

The study team examined bike share programs in localities that are comparable to Winchester and developed key takeaways and lessons learned from these programs. Localities studied were:

- Danville, Virginia,
- Blacksburg, Virginia, and
- Brusly, Louisiana

Danville, Virginia

With a population of 43,000, Danville is a smaller city in southern Virginia. The land area is 43 square miles and the main employer is Goodyear Tire and Rubber manufacturing, providing 2,000 jobs. Danville's bike share program launched in the summer of 2017 and consists of 5 stations and 25 bikes. The service area includes the recently expanded trail network along the Dan river. The city established the system primarily to expand recreation opportunities along the River Trail.

System Overview

The City of Danville contracted with Zagster to operate the program. Zagster supplied 25 smart lock bikes and 5 docking stations. Riders can unlock bikes by using the Zagster smart phone app. Bikes must be returned to a docking station. Unlike many dock-based systems, Danville's station docks do not contain locking equipment or features that require electricity or a network connection. Although the locking mechanism is located on the bikes, the bikes do not have GPS capabilities that allow the system manager to track bikes locations. When users unlock a bike, their smart phone app reports its location to Zagster

[10] Capital Bike Share. Retrieved from https://www.capitalbikeshare.com/ on May 28, 2020.
[11] The Economic Contribution of Public Bike-Share to the Sustainability and Efficient Functioning of Cities. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S2210670716303080 on May 28, 2020.
[12] The economic contribution of public bike-share to the sustainability and efficient functioning of cities. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S2210670716303080 on June 24, 2020.

for the duration of the trip. Zagster is fully responsible for operating the system, providing maintenance and bike replacement per the terms of its contract with Danville.

User Experience

In order to use the system, individuals must download the Zagster app and create an account to unlock bikes. Trips under an hour are free. After the first hour, the price is $3 per hour capping out at $24 per ride. Users are charged an additional $30 fee for keeping a bike over 24 hours.

Usage

Danville's bike share system has 5,240 active users as of February 2020. The system currently provides 753 trips per month, which is down from its first-year average of 867 trips per month.

Cost

The City of Danville paid a fixed fee to Zagster to launch and operate the system and Zagster is fully responsible for operating and maintaining the system. Danville paid Zagster $45,000 to launch the system. This fee included all administrative costs and capital costs for 5 docking stations and 25 bikes. Now that the system is up and running, the City pays Zagster a set operating fee of $1,800 per bike per year. Zagster is responsible for all maintenance, use, wear and tear, retrieval, and replacement of the bikes.

Revenue

The system is sponsored by *Reimagine that: Danville* and Gary P. Miller Cardiology Consultants. City Council funds most costs. Danville did not receive a state or federal grant to support the system. Danville staff indicated the fare-return rate is low and member fares do not represent a significant proportion of system funding.

Issues and Challenges

While the system has relatively high ridership, the City continues to have issues with bike vandalism and intentional destruction. The city is working with the local police to locate riders that are abusing the system. The large amount of vandalism has deterred the city from expanding service. The terms of Danville's contract with Zagster require the company to repair and replace damaged bikes at its own expense. This saves the City money in the near term but may increase operating costs under future contracts. While the bike share system has faced challenges, overall, the City believes it provides significant health and recreational benefits to the community.

Key Takeaways

Danville's decision to contract with Zagster for the launch and operation of its bike share system allowed it to start the service without relying significantly on in-house staff resources. The contract shifted the risk of unforeseen challenges on to the company and away from the City. The cost to launch and operate the system is near industry averages. While Danville may be able to achieve lower operating costs by taking on the responsibility for maintaining the system, the set-fee model reduces the risk of cost overruns. The City reports some difficulties with the locking mechanism of the bikes which has led to vandalism and the destruction of some bikes. Although Zagster currently replaces bikes at no cost to the City, it is in the City's interest to reduce vandalism to ensure the long-term viability of the system. The City also reported issues with Zagster's responsiveness to issues.

Blacksburg, Virginia

Blacksburg launched its bike share system, called Roam New River Valley, in the summer of 2018. The system currently operates 75 conventional bikes and 13 e-bikes with twelve stations. The system primarily serves the Virginia Tech campus, but its territory covers Blacksburg, Christiansburg and Montgomery County, an area with a population of just under 70,000.

System Overview

The system uses 88 bikes within the service area, with twelve hub stations. Users may ride anywhere in the service area and are encouraged to lock bikes at racks located in a hub. All locking technology is located on the bikes which are locked to standard bike racks. The service area and hubs are depicted on a map that is displayed in a smart phone app. If users attempt to lock a bike outside of the service area or hub, (s)he receives a notification asking the rider to move the bike to an appropriate location. Gotcha Bike, recently purchased by OJO Bikes, is the system manger, contracting with a local bike shop to maintain and balance the fleet.

User Experience

Bike share riders use the SoBi app to unlock and ride bikes. The app provides an unlock code that is then entered into a keypad located on the individual bike. At the end of a ride, users are encouraged to return the bike to a rack in one of the twelve hubs. One unique aspect of this system is the ability for users to reserve bikes for up to 15 minutes in advance of a trip. This allows bike share riders to plan trips without the fear of a conveniently located bike becoming unavailable. The system provides multiple pricing and membership options, ranging from $1 for single 15-minute trip to a $60 annual membership that allows two hours of riding per day.

Usage

Roam New River Valley does not officially publish detailed ridership data, but they reported 2,827 members in the first year of operation. Staff indicated that the system carries 60 to 70 rides per day, on average.

Cost

Blacksburg leases the bikes from the bike share operator, Gotcha Bike, which was recently purchased by OJO Bikes. The lease agreement specifies that the bike share operator is responsible for all maintenance of the bikes. Blacksburg pays $120 per month for each conventional bike and $225 per month per electric bike (including battery chargers). The system has at total fleet of 75 conventional bikes and 13 e-bikes with an annual cost to the City of $143,100. Although the Town of Blacksburg leases the bikes, the Town made a one-time purchase of bike racks and information panels that totaled $73,400. The total launch cost included the first-year bicycle lease ($143,100) and the one-time purchase ($73,400) for a total of $216,500.

Revenue

The system received a $200,000 Department of Rail and Public Transportation (DRPT) grant to launch the system with a $50,000 local match provided by Blacksburg, Christiansburg, and Virginia Tech. It is unclear if the system receives operating support outside of local funds provided by Blacksburg, Christiansburg, and Virginia Tech.

Issues and Challenges

The MPO manages Roam and a 10-person committee oversees its operation. The committee includes four voting members, along with representatives from the University, towns, and county. Roam is currently investing in new e-bikes, which have electric motors that assist riders. Blacksburg's bike share operator indicates that electric assist can increase ridership by 300% to 400%. Given these estimates, the new e-bike fleet would yield 300 daily trips. The MPO will replace the entire fleet with electronic assist, plus a doubling of its fleet. There are no reported issues with vandalism, as riders have a $2,000 liability for a missing and damaged bike.

Roam suggested that Winchester select one department or agency that is responsible for the system. They also recommended that the city should determine whether to exclude scooter from the system and to clarify that desire in any contracts with system managers.

Key Takeaways

Gotcha Bike maintains the system, with an agreement with a local bike shop. Roam suggested that Winchester select one department or agency that is responsible for the system. They also recommended that the City should determine whether to exclude scooters from the system and to clarify that desire in any contracts with system managers.

Brusly, Louisiana

Brusly, Louisiana has the smallest population of the peer regions with 2,750 residents and a land area of 2.2 square miles. Health care and social assistance is the largest employment sector. Launched in 2019, Brusly implemented a 2-station system with 15 bikes located along the Baton Rouge Heritage Trail which is located on a levee that protects the town from the Mississippi River. Like Danville, the system is recreational in nature and highlights the locality's natural assets. Unlike Danville, the ridership count is much lower at just 2 or 3 rides a day.

System Overview

Brusly's mayor came up with the idea for the bike share system to promote healthy lifestyles and provide a recreational activity to the residents after visiting other cities with bike share systems. The town launched a small bike share system using local funds and sponsorship support from one of the towns largest employers. Brusly owns and operates its bike share system. Brusly purchased bikes from Koloni, an Iowa-based bike share provider that caters to small markets. Koloni also provides a smart phone app used to unlock bikes and process credit card payments. The system uses smart locks at two hubs, which are standard bike racks designated for bike share bikes.

User Experience

Users must download a smart phone app and store their payment information in the app to use the system. To unlock a bike, the user opens the app which uses Bluetooth to wirelessly connect to a bike. Users pay $2 per hour to ride a bike but employees of Dow Chemicals ride for free because of a sponsorship agreement with the Town. If a rider fails to return a bike to one of the two hubs, the system charges a $10 fee to the user. The town also provides a monthly membership option for $10 that allows up to two hours of free biking per day.

Usage

The system currently receives low utilization and averages two to three total rides per day. Total memberships peaked at 16 members. The relatively low utilization is likely because the system is relatively new and only supports recreational cycling along a single trail. Since bikes are used for recreation and not for transportation, usage is highest on evenings, weekends, and holidays.

Cost

The startup cost of Brusly's system was $23,000. This figure includes the purchase of 14 bikes and surveillance cameras located at the hubs to deter vandalism. The Town pays Koloni $2,500 per year to use their smart phone app and Koloni charges a fee of $0.50 per transaction to process credit card payments. Brusly owns and operates the system and reached a maintenance agreement with a local bike shop to perform all maintenance on an as-needed basis. When a bike needs repair, the bike shop picks up the bike, repairs it, returns it, and bills the Town for the cost of the service. The Town pays approximately $5,000 per year for maintenance.

Revenue

Brusly reached a sponsorship agreement with Dow Chemicals, a large employer in town, to cover the full $23,000 startup cost of the system. Dow's logo is featured on all the bikes and its employees can use the system free of charge. The Town covers the operating cost, which currently totals approximately $7,500 per year.

Issues and Challenges

The town reports an overall positive experience with bike share. Although utilization is low, residents are generally supportive of the program and proximity to bike share has been used in local real estate listings. There has been minimal vandalism so far but the Town reports that people sit on the locked bikes and spin the pedals, leading to additional in maintenance costs.

Key Takeaways

Brusly's bike share system is an example of a very small, low cost system. Although the startup costs were average (around $1,500 per bike), the operating budget is low (around $500 per bike per year), due to the Town taking full responsibility for managing the system.

TABLE 1 PEER REGION SUMMARY

	Ownership Model	Operator	# of Stations	# of Bikes	Approx. Daily Ridership	Startup Cost	Annual Operating Cost
Danville, VA	Leased	Zagster	5	25	25	$45,000	$45,000
Blacksburg, VA	Leased	Gotcha	12	88	60-70	$250,000	$143,100
Brusly, LA	Publicly Owned	Brusly, LA	2	15	3	$23,000	$7,500[13]

[13] Does not include cost of bike replacement

Local Context

Demographics

Bike share ridership is closely related to population density, employment, and prevalence of non-auto modes of transportation. EPR, P.C. collected U.S. Census data to analyze Winchester's demographic characteristics and compare it to other cities and regions with bike share systems.[14]

Winchester's daytime population grows by 68% reflecting the city's status as a center of regional employment

TABLE 2 DEMOGRAPHIC COMPARISON OF BIKE SHARE LOCALITIES

Characteristic	Winchester	Blacksburg-Christiansburg	Chattanooga	Danville	Richmond
Population	27,789	68,421	177,365	41,512	223,787
Population Density	3,023	1,926	1,241	970	3,735
Daytime Population	46,888	94,851	279,108	56,310	338,549
% Households without a Car	9%	11%	10%	16%	17%
% Transit, Bike, Walk Commute	8%	16%	6%	5%	13%

Despite its modest population, Winchester is denser than the peer bike share communities in Danville and Blacksburg-Christiansburg and is nearly as dense as Richmond. Winchester's daytime population grows by 68% reflecting the City's status as a center of regional employment. These data points indicate Winchester compares favorably to other city's with bike share systems. Nine percent of households in Winchester do not have access to a vehicle and eight percent of the City's workers commute to work by transit, bike, or foot. A significant majority of City residents primarily use cars for transportation but the car-dominated nature of Winchester's trip-making is similar to the average of comparable bike share communities.

Transportation Network

Road Network

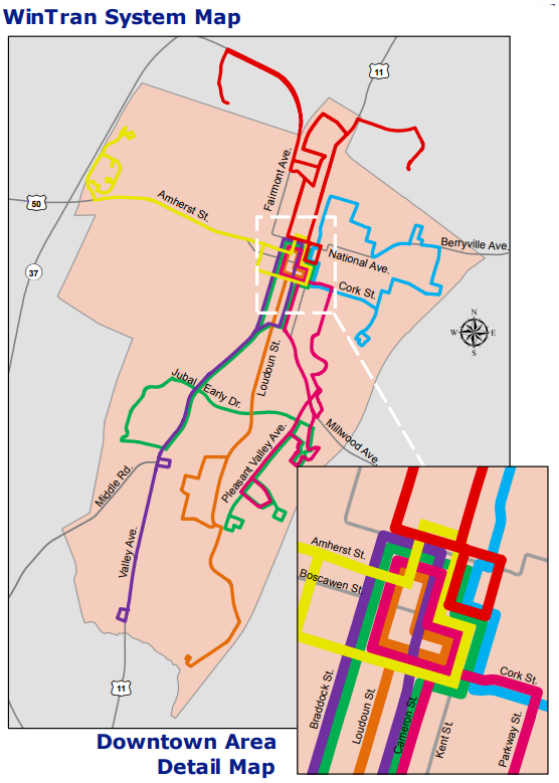
Winchester is located at the intersection of several major regional and national roads. Interstate 81 lies along the eastern border of the City and State Route 37 forms a Western bypass around Winchester. US Routes 50, 522, and 11 all pass through the center of Winchester. State Route 7 begins in Winchester and connects to Alexandria to the east. Winchester is well served by highways and major roads providing automobile mobility throughout the City and region.

[14] Brusly, LA was not included in this demographic analysis because it is considerably smaller than Winchester.

Public Transportation

In Winchester, the public transit system, WinTran, is run by the city. There are fixed-routes and para-transit running Monday to Friday from 6 am to 8 pm and Saturday from 8:50 am to 5 pm. There is also a trolley that runs from 8 am to 6:45 pm on Monday, Wednesday, and Friday, as well as 10:10 am to 4:30 pm on Saturday. WinTran offers 8 different routes around Winchester: Berryville Ave, Valley Ave, Apple Blossom Mall, Northside – Salvation Army, Amherst Street, South Loudoun, Northside – Westminster Canterbury, and the Trolley. Fairs are $1 per ride for adults, $0.50 for seniors, individuals with disabilities, and students. Children under two years old ride for free.[15]

FIGURE 2 WINTRAN BUS SYSTEM MAP



WinTran records 139,500 passenger trips annually on the fixed routes that are offered. The total daily ridership recorded for the fixed routes was 502 passenger trips on weekdays and 256 passenger trips on Saturdays. The mean weekday ridership was 71 passenger trips, including the trolley route and 79 passenger trips without the Trolley route. Saturday ridership averaged 37 passenger trips per route including the Trolley route and 41 passenger trips without the trolley route. The Apple Blossom Mall route has the highest ridership among the fixed routes, with 111 passenger trips per day during the week and 68 passenger trips on Saturdays. The Valley Avenue route was the second busiest route during the week with 106 passenger trips per day. The Trolley route exhibited the lowest ridership and productivity, both on the weekday and Saturday counts. The Amherst route also exhibited ridership and productivity that were significantly lower than the mean of 43 weekday passenger trips and 15 Saturday passenger trips.[16]

Bike Network

Currently, there are a few roads with bike facilities in the City, including Valley Avenue, Clifford Street, Washington Street, Jubal Early Drive, Meadow Branch Avenue, Boscawen Street, E. Cork Street, Amherst Street, University Drive, and Middle Road. This infrastructure includes bike lanes, shared use paths, and sharrows. There is a map of existing bike facilities in Figure 6 on page 22 of this report.

The Green Circle Trail provides several sections of off-street shared-use path along its alignment. The trail spans the City, including the University Area, Town Run Linear Park, Town Run Canyon, Old Town Winchester, Amherst Street Corridor, Meadow Branch Avenue Corridor, and Jubal Early Drive Corridor.

[15] City of Winchester, Virginia – Public Transportation. Retrieved from https://www.winchesterva.gov/public-transportation on May 28, 2020.
[16] City of Winchester Transit Development Plan. Retrieved from https://www.winchesterva.gov/sites/default/files/documents/transit/city-of-winchester-tdp-final-aug-2011.pdf on May 28, 2020.

There are current plans to add more segments to the Green Circle Trail and connect the community to more activities.

For more on Winchester's existing bike network and recommendations for improvement, see the Bicycle Network Recommendations section of this report beginning on page 21.

Stakeholder Interviews

EPR, P.C. conducted stakeholder group interviews to gather information about potential opportunities and challenges for bike share in Winchester.

The project team conducted four stakeholder interviews over Zoom video calls. The calls occurred on April 23rd, April 28th, April 30th, and May 4th. Each interview lasted about one hour. EPR,P.C. met with 17 stakeholders over the four interviews, including:

- Amanda Kerns, WinFred MPO
- Karen Taylor, WinFred MPO
- Justin Kerns, Winchester Frederick County Bureau
- Molly Minch, Winchester Parks and Rec
- Sam Kirstin, Winchester Parks and Rec
- Lynn Miller, Winchester Parks and Rec
- John Madera, Northern Shenandoah Valley Regional Commission
- Justin Hall, City of Winchester Public Works
- Tim Youmans, City of Winchester
- Terry Short, VDOT
- Mike Wade, Valley Health
- Tracy Mitchell, Valley Health
- Cynthia Schneider, Top of Virginia Regional Chamber
- Matt Levy, Shenandoah University Student Engagement
- Barry Schnoor, Shenandoah University Physical Plant
- Cindy Dalton, Shenandoah Valley Battlefield Commission
- Perry Matthews, Museum of the Shenandoah Valley

There were three engagement goals for the stakeholder interviews:

- Collect information about the region,
- Have stakeholders comment on feasibility of a bike share system, and
- Identify potential opportunities for partnerships and sponsorships.

EPR, P.C. presented stakeholders with a background on the study, purpose of the study, what bike share is, examples of bike share systems from research and interviews, and how the systems operate. After giving the presentation, EPR,P.C. conducted a discussion with stakeholders on opportunities for bike share, challenges that would arise through this process, interested organizations that would partner with or sponsor the bike share program, and needs.

Key Takeaways

There was universal support from stakeholders for the concept of a bike share system in Winchester. Stakeholder comments were organized into five categories and summarized below.

Opportunities

Stakeholders mentioned several opportunities where bike share could support recreation and tourism, including the Green Circle Trail, and opportunities for economic development. Stakeholders discussed benefits of connecting the community to their jobs as well as local businesses and restaurants. Other opportunities for bike share mentioned include:

- Winchester's compact size would allow for easy short distance travel;
- Bike share would increase nonvehicular access to the downtown core;
- Bike share would alleviate vehicle traffic and create a more pedestrian friendly downtown core;
- Winchester has many parks, battlefields, mixed use paths and recreation opportunities that could benefit from the implementation of the bike share system;
- Bikes could assist with commuting to jobs for those who do not have access to cars or choose not to use cars; and
- Bike share would provide a connection between Shenandoah University Main Campus and the Medical Campus.

Challenges

There are several challenges to implementing the bike share system, one being the lack of bike facility infrastructure in Winchester. Many stakeholders identified this as a major concern and were only able to list a handful of streets where there is bike infrastructure. Even with the infrastructure in place, most agreed that safety on many roads in Winchester is a key issue. Other challenges include:

- Bikes are not allowed on the Downtown Pedestrian Mall;
- Bike availability if users ride downhill but not uphill (balancing racks);
- Potential users feeling safe enough to try bike share;
- Reliability of equipment;
- Smart phone access if a system requires one;
- Credit card access
- Topography of Winchester;
- Financial cost of implementation; and
- Providing helmets and other safety equipment.

Organization Interest/Possible Partnerships

Several organizations expressed interest in partnerships and sponsorships: Winchester Parks and Recreation, Valley Health, Museum of the Shenandoah Valley, Shenandoah University, and the Winchester-Frederick County Convention & Visitors Bureau. These stakeholders would need additional information on the results of the study to move forward but supported the concept.

Bike Infrastructure

As mentioned in the *Challenges* section, one issue that Winchester faces regarding bike share system implementation is the lack of bike infrastructure in the area. Many of the stakeholders identified a need for additional bikes lanes, as well as driver education on how to best interact with bikers on the road.

Potential Bike Share Locations

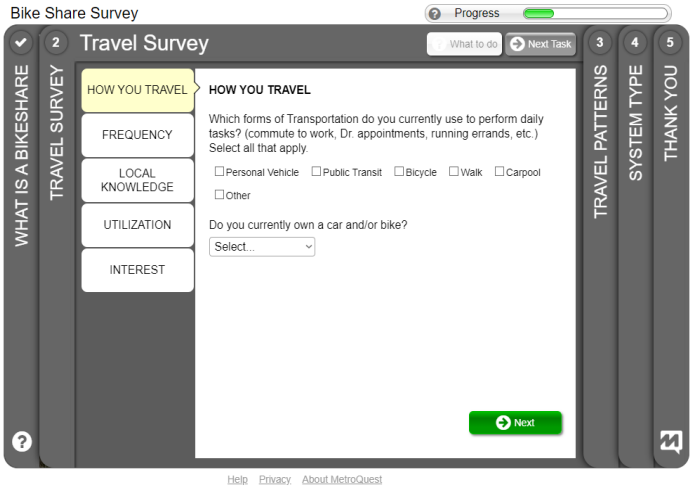
During the interview process, stakeholders suggested locations that would be ideal for the bike share system. These locations would connect biking to other forms of transportation, allow community members the ability to enjoy recreation and leisure riding, boost economic development by connecting developing areas to established areas, and provide opportunities for people to acquire necessary goods without a motorized vehicle. These locations included:

- Valley Health Medical Campus and Fitness Center,
- Shenandoah University,
- Cameron Street bus stop,
- Downtown Pedestrian Mall,
- Museum of Shenandoah Valley,
- Developing neighborhoods,
- Mount Jackson Park,
- Jubal Early Drive,
- Winchester Public Schools,
- Green Circle Trail,
- Industrial Park,
- Battlefields,
- Visitor Center,
- North Branch,
- Berryville,
- Stephens City,
- Grocery stores, and
- Walmart.

Public Survey

The WinFred MPO and VDOT conducted an opinion survey of the public to gauge the level of general interest in launching a bike share system in Winchester. The survey was conducted using MetroQuest, the online survey platform that VDOT uses to collect feedback for planning projects around Virginia. The survey included multiple-choice questions and a map survey tool that allowed participants to indicate locations where they would like to travel using a bike share system.

FIGURE 3. METROQUEST SURVEY SCREEN



The survey was open from June 1 through June 19, 2020 and was completed by 149 individuals. Forty-five percent of participants learned of the survey on Facebook, 48% from "other" sources, and a small percentage from newspapers and public meetings.

The survey asked respondents about their current travel patterns, whether or not they own a bike, their knowledge of local bike trails, and their likelihood to use bike share in Winchester. The full list of survey questions and responses is located in Appendix A: Survey Results.

Survey Analysis

This section presents several key takeaways from an analysis of the survey responses. Detailed responses to each survey question can be found in Appendix A: Survey Results

Most survey respondents are not avid bike riders but many are aware of bike share.

When asked how regularly they use a bike, 74% of respondents indicated they never or only occasionally ride a bike. Approximately 54% of participants own a bike which is almost identical to the national bike-ownership rate of 53%.[17] While 95% of survey participants report using a personal vehicle for daily trips, only 12% indicate they use a bike for common trips. Although most respondents are not regular bike riders, 86% said they are familiar with Winchester's bike trails. This may be due to the prominent branding of the Green Circle Trail. Forty-three percent of participants have used a bike share system in another city. This indicates a relatively high public familiarity of bike share and may be partially a result of Capital Bike Share's proliferation in the Northern Virginia suburbs of Washington, D.C.

Most survey respondents would use bike share but only a few would use it daily.

Three-fourths of respondents indicated they would use bike share, with 4% using it daily, 26% weekly, and 45% monthly. Considering 74% of respondents are not regular bicycle riders, this response suggests bike share would induce many non-bike riders to use bike share in Winchester.

Survey respondents would primarily use bike share for recreational trips.

Fifty-seven percent of survey respondents indicated they would use bike share for recreational trips and only 23% said they would use it for going to work, school, or shopping. This response may be an indicator that people in Winchester generally view bicycling as a recreational activity today. A bike share system with stations located near popular every-day trip destinations may induce a greater proportion of non-recreational bike trips in Winchester. However, it is a good idea to locate bike share stations near parks and trails to facilitate fitness and recreation-oriented trips.

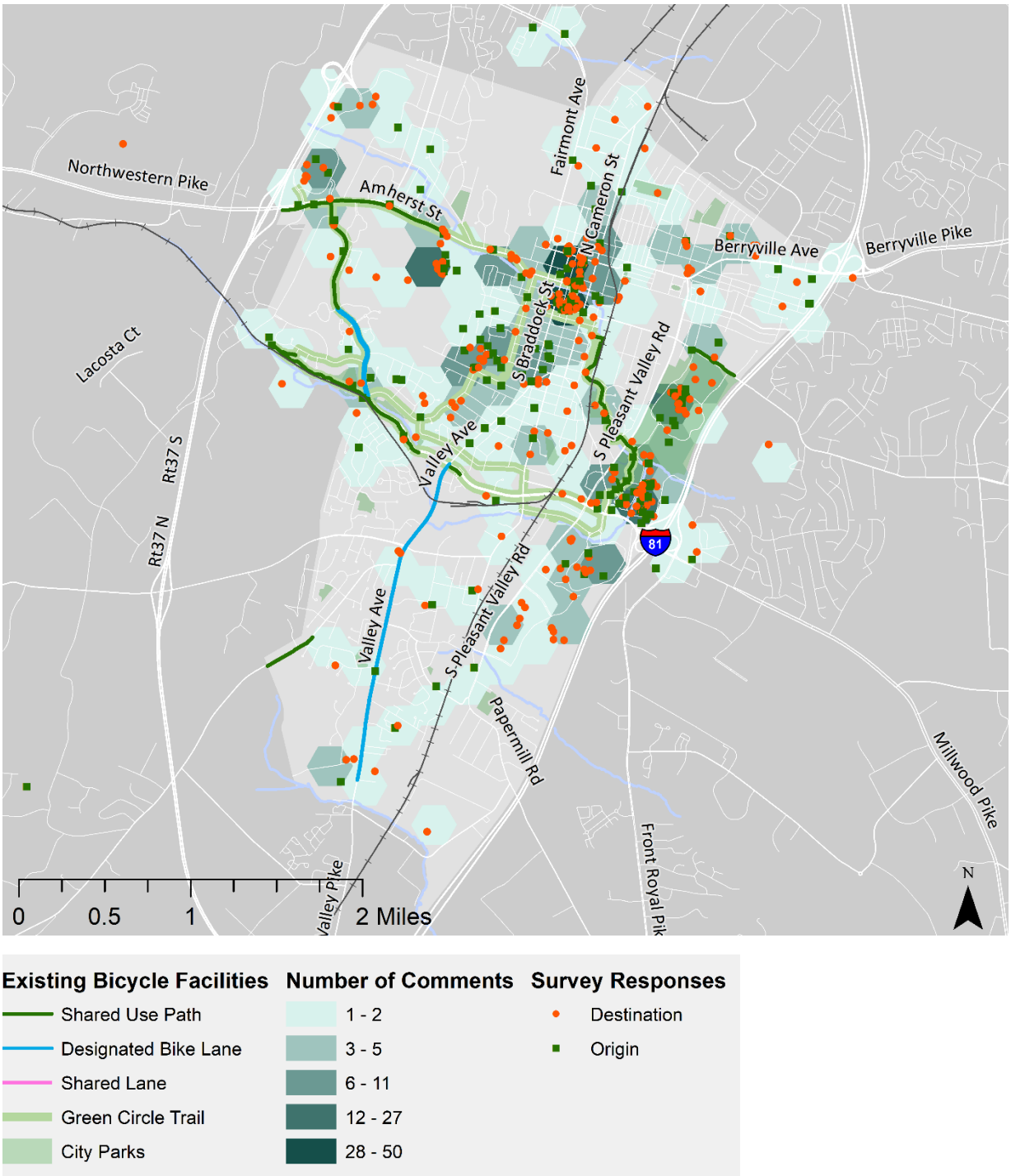
Map Responses

Survey participants were invited to place "pins" on an interactive map at origins and destinations that they would like to access using a potential bike share system. Respondents placed pins at 437 locations. The map on the following page displays these pins as well as a heatmap indicating how comments were concentrated throughout the City. The highest concentration of potential trip origins and destinations are

[17] Car, bike or motorcycle? Depends on where you live, Pew Research Center, 2015. https://www.pewresearch.org/fact-tank/2015/04/16/car-bike-or-motorcycle-depends-on-where-you-live/

Old Town, Shenandoah University, Museum of the Shenandoah Valley, Handley High School, and Winchester Medical Center.

FIGURE 4. POTENTIAL BIKE SHARE TRIP ORIGIN AND DESTINATIONS SUBMITTED BY SURVEY RESPONDENTS

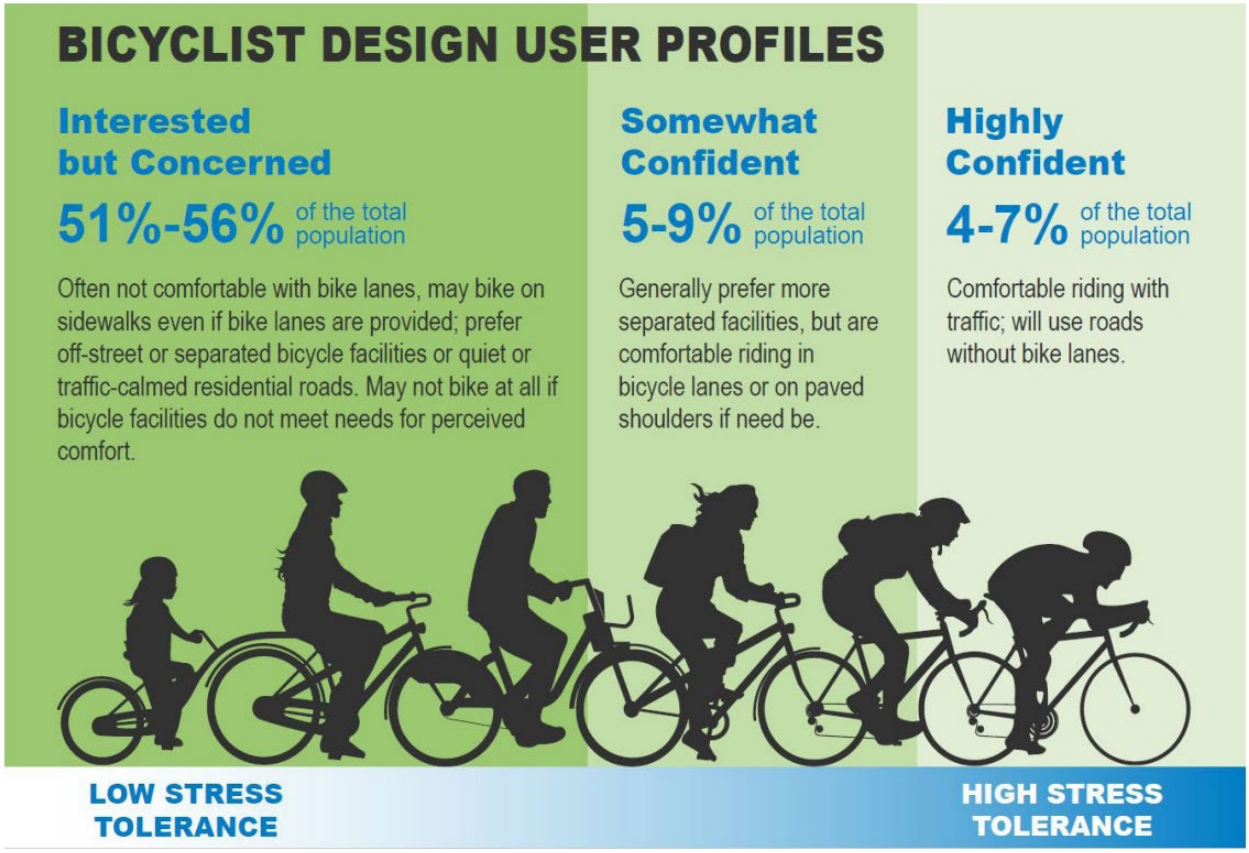


Bicycle Network Recommendations

Providing a network of bike paths that are physically separated from vehicle traffic will significantly increase the number of people who are able to use a bike share system.

Bike share systems work best in locations with a network of safe, comfortable, and connected bicycle facilities. Bike facility planners typically identify a target user when designing bike facilities and networks. Some bike riders are comfortable riding on a street with no separate facilities; some less-confident riders prefer separate bike lanes; and others will only ride on paths with no motorized vehicle traffic. The FHWA developed three bicycle user design profiles to aid in bike network planning and design.[18] These profiles are illustrated in Figure 5. Research indicates over half of potential bike riders are not comfortable riding in on-street bike lanes that do not provide physical separation from vehicle traffic. Providing a network of bike paths that are physically separated from vehicle traffic will significantly increase the number of people who are able to use a bike share system.

FIGURE 5 BICYCLIST DESIGN USER PROFILES, FHWA



EPR, P.C. reviewed the existing bicycle network and developed a set of recommendations aimed at increasing the potential for success of bike share in Winchester. The WinFred MPO and City of Winchester

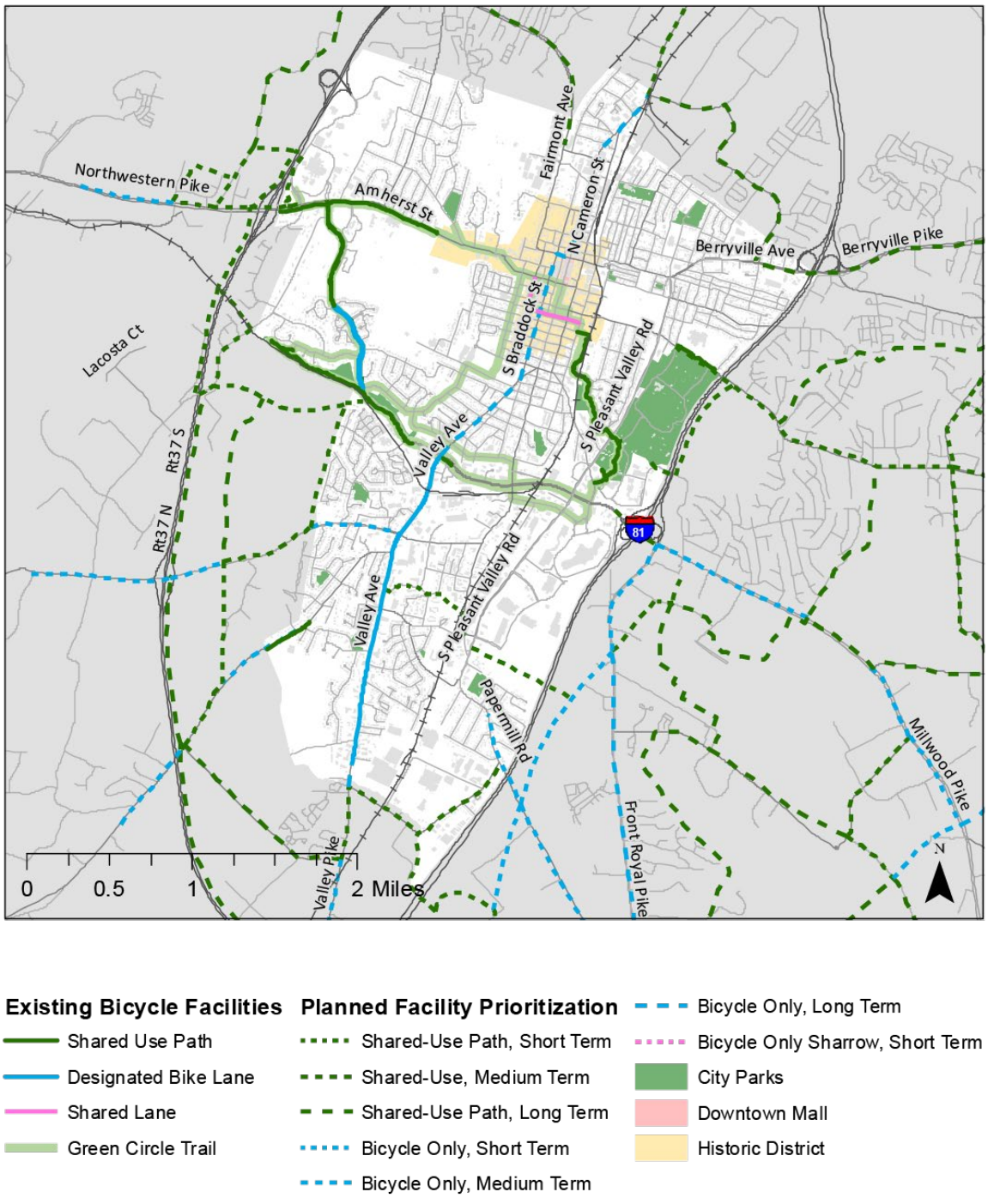
[18] Bikeway Selection Guide, Federal Highway Administration, 2013. https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf

provided GIS datasets with existing bike facilities and potential bicycle routes identified by the region's bicycle and pedestrian plan.

Existing Bicycle Network

Figure 6 displays all existing bike facilities in Winchester as well as potential bike routes identified by the region's bicycle and pedestrian plan.

FIGURE 6 EXISTING AND PLANNED BICYCLE FACILITIES IN WINCHESTER



Green Circle Trail

The Green Circle Trail project is a City of Winchester initiative to build a safe biking and walking facility that loops through the City, connecting areas of interest, including historical sites, Old Town, parks, Shenandoah University, the Museum of the Shenandoah Valley, and the Winchester Medical Center. Although some trail segments are complete as shared use paths or bicycle lanes, other segments are not yet complete.

Shared Use Paths

Winchester has a growing network of shared use paths which are off-street paths shared by bicyclists and pedestrians. Shared use paths can be located directly adjacent to streets or along their own rights of way through parks or along streams. Shared use paths are an effective design treatment for wide streets with high vehicle volumes and speeds.

Bicycle Lanes

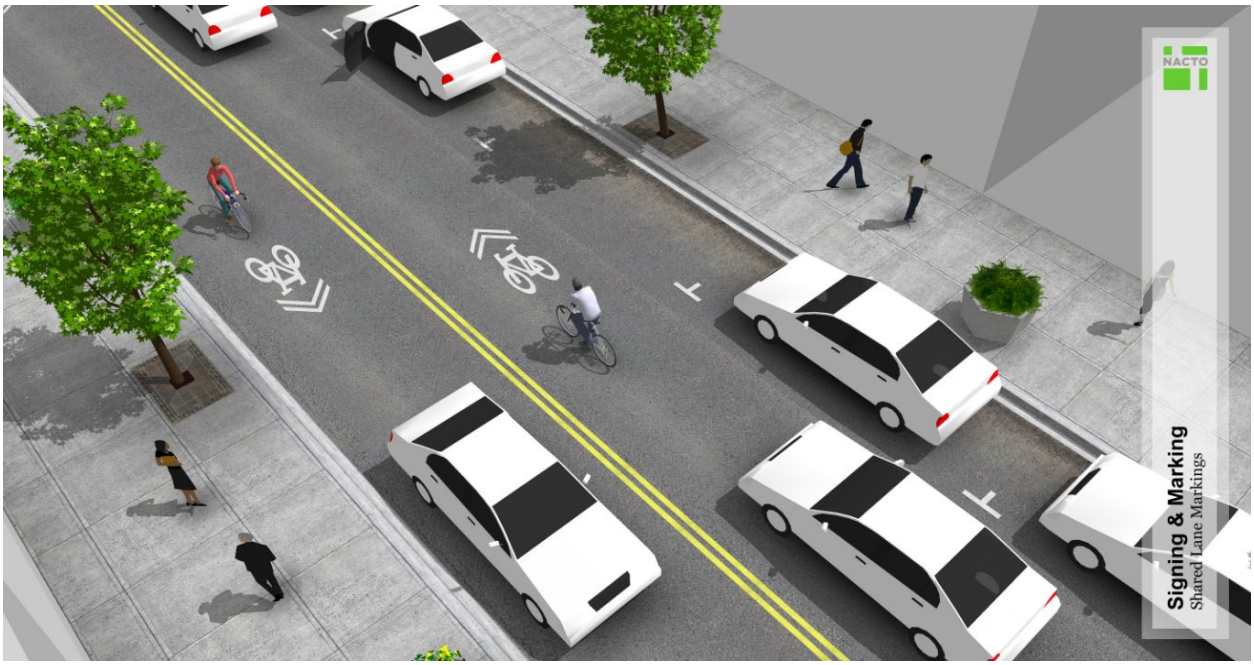
Winchester has implemented conventional bicycle lanes on two streets: Meadow Branch Ave and Valley Ave. Conventional bike lanes provide bike riders with dedicated space on the roadway but do not provide physical separation from traffic.

FIGURE 7 TYPICAL CONVENTIONAL BICYCLE LANE DESIGN, NACTO

Shared Lane Markings (Sharrows)

Shared lane markings (sharrows) are used on routes where bicycles and vehicles share the same travel lane. These markings provide a visual reminder to drivers to expect bike riders in the travel lane. They also communicate to bike riders the appropriate place to ride in the lane. Shared lane markings are useful in limited circumstances but should not be used as part of a network of safe, comfortable bike network aimed at less-confident riders. Winchester has installed shared lane markings on Clifford St and Washington St in Old Town.

FIGURE 8 SHARED LANE MARKINGS, NACTO



Recommendations

Recommendation 1: Design Future Bike Facilities for All Ages and Abilities

Winchester should adopt the *All Ages and Abilities* approach to designing and implementing future bike facilities within the City. This approach recognizes that potential bike riders vary by age, physical ability, skill, and level of confidence. To provide useful facilities for the most people, the *All Ages and Abilities* approach selects facility designs that work for children, seniors, inexperienced riders, and individuals with disabilities. Facilities that work for these populations also work for physically-fit, experienced, and confident bike riders.

This design approach is critical to ensure the viability of bike share in Winchester. Bike share systems significantly increase the number and types of bicycle trips that are possible. Many people use bike share to make spontaneous trips or connect to transit. Bike share users vary widely in level of confidence and tolerance to stress and overwhelmingly prefer to ride in comfortable, low-stress bike paths. Providing high-quality, comfortable bike paths will reduce the barrier to entry to many potential bike share users and increase the usefulness of bike share to the broader Winchester community. Since many bike share systems rely on membership fees to cover a significant portion of their costs, building a high-quality bike network is critical to solidify the financial viability of bike share into the future.

The National Association of City Transportation Officials (NACTO) provides a helpful guide to implementing the *All Ages and Abilities* approach to bicycle facility design. This document includes strategies for implementing a bicycle network as well as facility design recommendations.[19] The Federal Highway Administration (FHWA) also provides guidance for selecting appropriate bicycle facility types in

[19] Designing for All Ages and Abilities, National Association of City Transportation Officials. https://nacto.org/publication/urban-bikeway-design-guide/designing-ages-abilities-new/

its Bikeway Selection Guide.[20] Together, these guides provide much of the information needed to implement an *All Ages and Abilities* bicycle network in Winchester.

Recommendation 2: Extend Existing Off-Street Paths

Winchester has implemented several segments of shared use paths around the City. These paths provide a comfortable place to ride for bike riders of nearly all confidence levels and abilities. The City's shared use paths will be an attractive place to ride for people who are new to bicycling and may be interested in trying a bike share system. Winchester should focus its bicycle network expansion efforts on extending these high-quality paths to provide more opportunities for off-street bike share rides.

The city's shared use paths will be an attractive place to ride for people who are new to bicycling and may be interested in trying a bike share system.

Amherst St, Meadow Branch Ave, and Jubal Early Dr all feature shared-use paths running adjacent to the roadway for some but not all of their segments. These paths are likely to attract bike share trips but their relatively short length and lack of connectivity to a broader network will limit their usefulness to bike share users. Rather than build additional shared use paths elsewhere in the City, Winchester should focus on extending these paths so that bike share riders are able to take longer trips and reach more destinations.

Meadow Branch Avenue connects to shared use paths along Amherst Street to the North and Jubal Early Drive to the South. Although some portions of Meadow Branch Avenue have a shared use path, the segment from Jubal Early Drive to Buckner Drive has conventional bike lanes. Winchester should upgrade the segment with conventional bike lanes to create a nearly 3-mile *All Ages and All Abilities* bicycle route. Eliminating on-street parking in one direction would provide enough street space to create a physically separated two-way cycle track. This cycle track would create an on-street extension of the shared use paths located on either end of Meadow Branch Avenue. This segment is surrounded by single-family residences with most entrances located on side streets, indicating there is likely low demand for on-street parking. Implementing a cycle track on this segment will likely require new markings and the installation of flexible delineators but no changes to curb lines. Figure 9 and Figure 10 illustrate the existing and proposed cross sections.

[20] Bikeway Selection Guide, Federal Highway Administration. https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf

FIGURE 9 MEADOW BRANCH AVENUE EXISTING CROSS SECTION

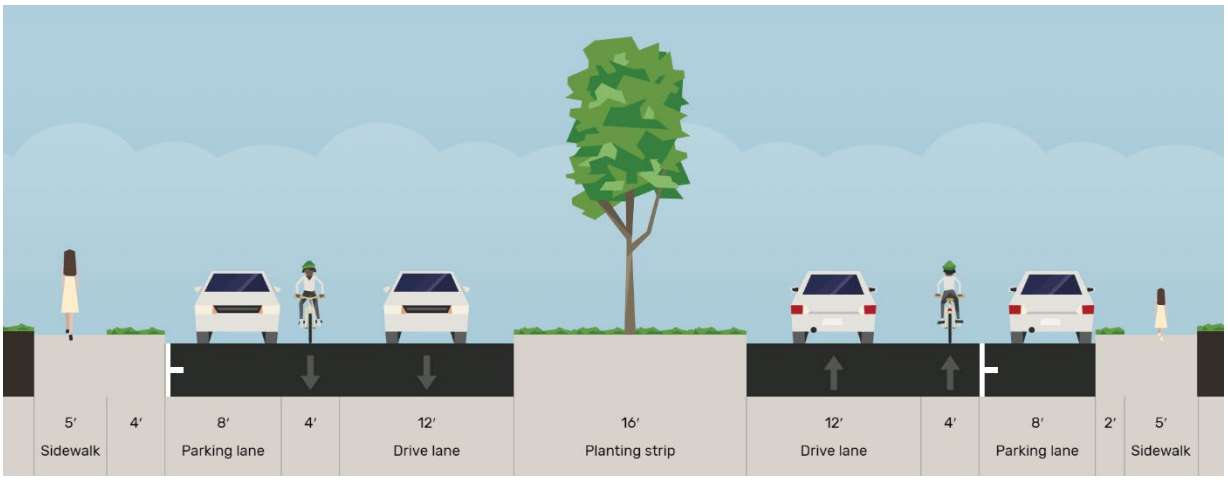
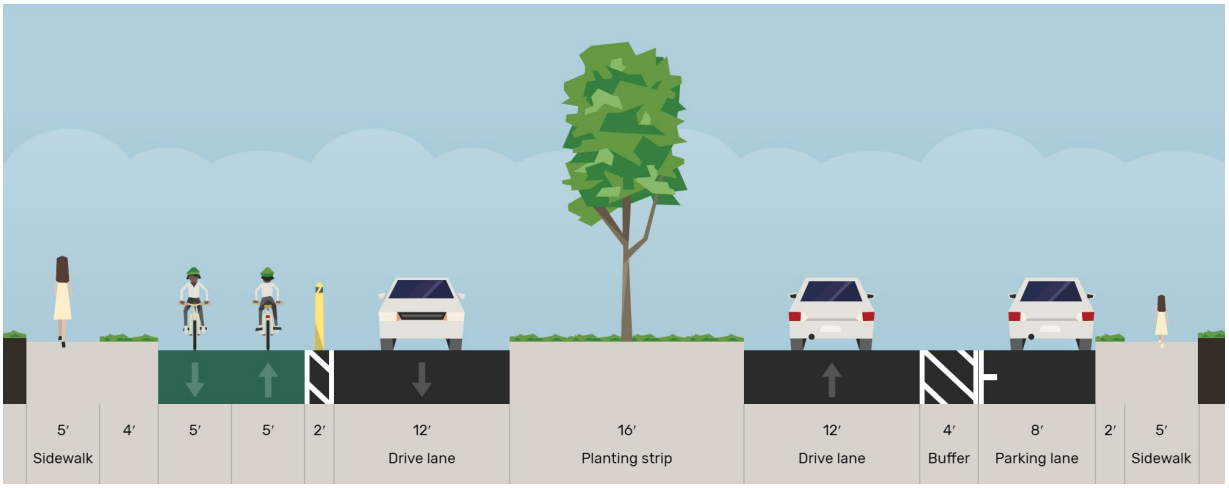


FIGURE 10 MEADOW BRANCH AVENUE PROPOSED CYCLE-TRACK CROSS SECTION



Recommendation 3: Complete the Green Circle Trail with Physically Separated Paths

The Green Circle Trail has the potential to attract a high number of bicycle trips of all kinds. The trail has unique branding, a recognizable wayfinding system, and connections to many of Winchester's most important destinations. Even though not complete, the trail represents a significant community asset. It will connect residents to schools, parks, and jobs, and provide a unique opportunity for recreation and exercise. A completed trail would also enhance the competitiveness of Winchester's tourist attractions. Once complete, tourists will be able to spend a day in Winchester biking on a safe, comfortable path while visiting cultural sites, museums, restaurants, and local businesses. A bike share system will better allow visitors to take advantage of the trail by eliminating the need to bring a bike.

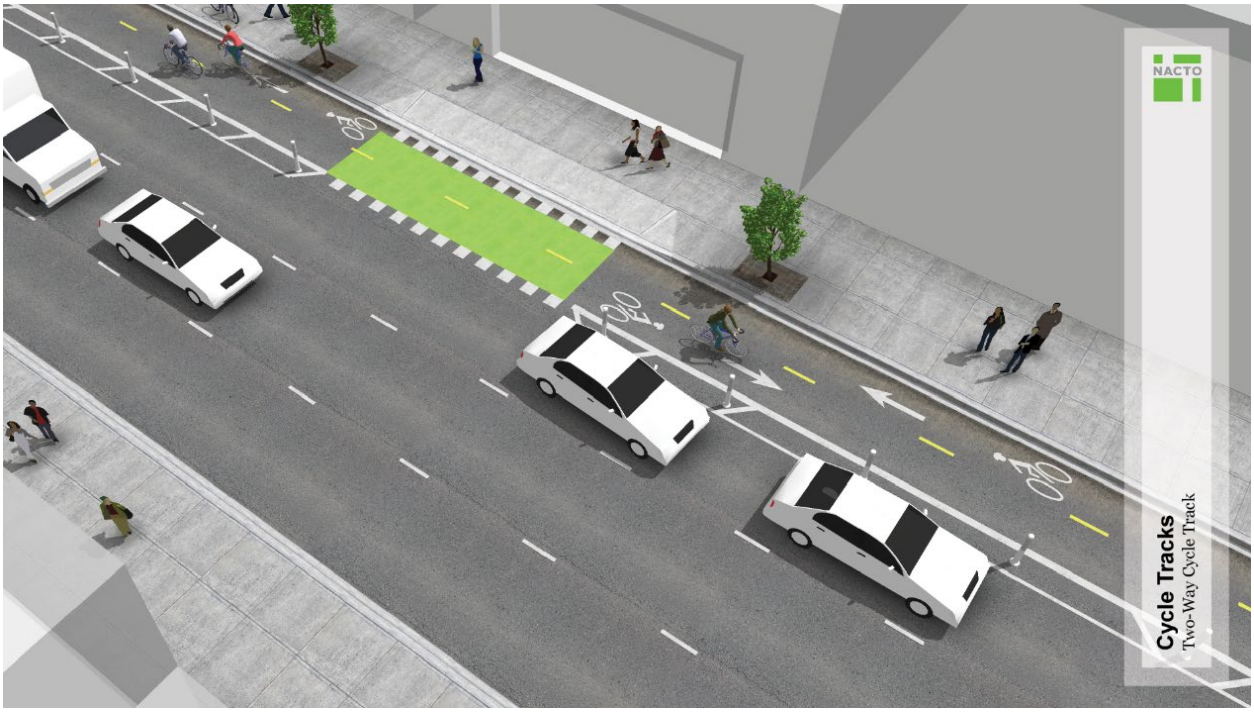
Winchester has made significant progress towards completing the Green Circle Trail by incrementally building out paths along the trail alignment. Winchester should continue this project and complete the entire trail with *all ages and abilities* paths. A completed trail will likely enhance the attractiveness of bike share to tourists and visitors.

The trail alignment through Old Town follows narrow streets that present a challenge to bike facility design. It will be challenging to design safe, comfortable bike facilities on these narrow streets without decreasing on-street parking or vehicle capacity. It is critically important to bridge these gaps and provide a complete network of *All Ages and Abilities* paths along the Green Circle Trail alignment. Old Town is a significant attraction on the Green Circle Trail and failure to provide safe and comfortable paths to Old Town will likely deter many people from using the Trail. Winchester should explore implementing on-street physically separated bike lanes (cycle tracks) through Old Town. Implementing these facilities will require reconfiguring streets in some instances. Winchester should consider the following strategies for allocating street space to bicycle lanes:

A bike share system will make it easier for visitors to take advantage of the trail by eliminating the need to bring a bike.

- One-way street conversions
- Elimination of on-street parking on one or both sides of the street
- Realignment of Green Circle Trail to other streets

FIGURE 11 TWO-WAY CYCLE TRACK, NACTO

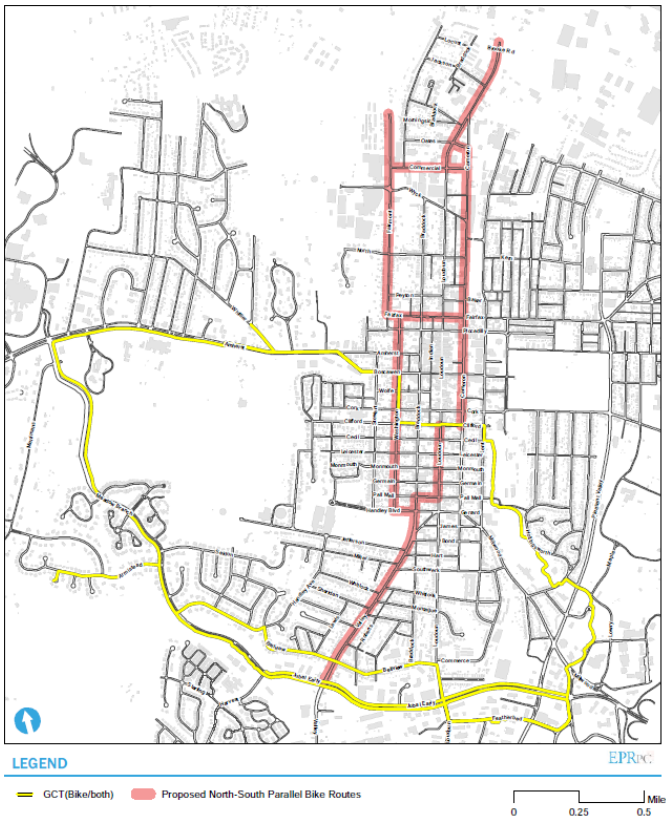


Recommendation 4: Close North-South Gap through Downtown

Much of Winchester's bike network is focused on the Green Circle Trail which makes a loop through the City passing through Old Town. This configuration serves East-West bike trips well but leaves a gap for people who would like to bike North or South through Old Town. Winchester should establish a high quality, *All Ages and Abilities* bike corridor running North-South through the center of the City.

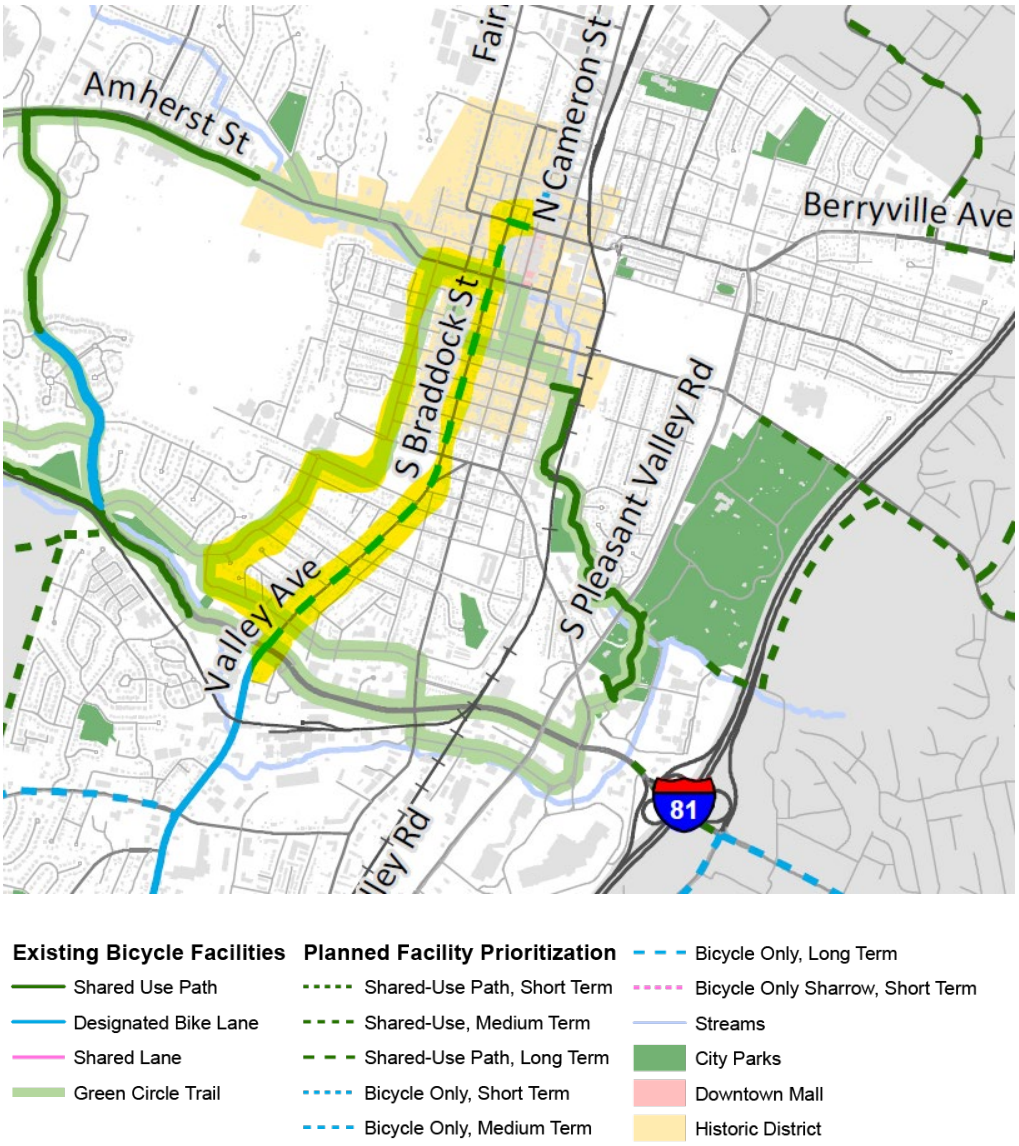
In 2018, EPR completed a North-South Bicycle Route study to identify potential routes to close the North-South gap through downtown. This study recommended implementing two parallel bicycle routes, some street segments with striped bicycle lanes and others with shared lane markings (sharrows) as street-width allows. According to the FHWA Bikeway Selection Guide, 9-16% of bicyclists are comfortable using shared lanes and conventional bicycle lanes (these are somewhat or highly confident bicyclists). This approach would provide a significant improvement over current conditions but would not provide an *all ages and abilities* route through downtown sufficient to encourage broad use of a bike share system.

FIGURE 12. NORTH-SOUTH BICYCLE ROUTE STUDY 2018, EPR



The WinFred MPO's bicycle and pedestrian plan identified a potential long-term priority route along Valley Avenue, S Braddock Street, and N Cameron Street. The Green Circle Trail alignment offers another potential for a North-South corridor along Handley Avenue and South Stewart Street. Both alignments could fill the North-South gap in different ways using different approaches.

FIGURE 13 NORTH-SOUTH GAP IN BICYCLE NETWORK WITH TWO APPROACHES HIGHLIGHTED



Approach 1: Physically Separated Path on Valley Avenue

People prefer direct and short routes to their destinations whether driving in a car or riding a bike. Since Valley Avenue provides the most direct North-South route through the center of Winchester, bicyclists will naturally be attracted to riding on Valley Avenue. However, the vehicle volumes and speeds along this corridor discourage riding. One approach to providing a North-South connection is to install physically separated bike lanes on Valley Avenue. This would likely require a significant reconfiguration of the roadway and would require careful planning and design.

Approach 2: Bicycle Boulevard on Local Streets

Another approach to filling the North-South gap is to identify a parallel route along local streets that have lower vehicle volumes and speeds, designating the route as a bicycle boulevard. This will require cyclists to take longer, less direct trips, but can be a viable option if the alternate route is considerably more comfortable than the direct alternative (Valley Avenue). A bicycle boulevard is a treatment that combines

markings and signage to prioritize bicycle riders on local, slow-speed streets. On a bicycle boulevard, a variety of treatments slow motor vehicles for a more comfortable and safer environment for shared travel lanes. These treatment options include chicanes, traffic diverters, neighborhood traffic circles, and signage.

These approaches represent two different ways Winchester could close the North-South bicycle gap. Additional study and community engagement are necessary to identify the best approach in Winchester.

Recommendation 5: Connect Neighborhoods to Bike Network

Winchester should connect its neighborhoods to its core network of *All Ages and Abilities* bike paths. EPR, P.C. conducted a bike share suitability analysis of Winchester that identified the parts of the City best suited for bike share and bicycling in general. This analysis highlighted several neighborhoods that have the attributes that make them ideal for biking. After the City builds out a core network of paths and physically separated bike lanes, the City should connect these neighborhoods to the bike network.

Neighborhood bike corridors could be located on local streets with low vehicle speeds and volumes, utilizing bicycle boulevard treatments which require a lighter touch than facilities with greater physical separation from traffic.

Bike Share System Plan

EPR, P.C. developed a three-phase bike share implementation plan to allow Winchester to start small and expand the program as desired. To create this plan, EPR, P.C. conducted a suitability analysis to guide the system planning process and identify ideal service areas. An equity analysis helped evaluate the system plan and determine its effect on historically underrepresented populations. The system plan includes a business plan with a cost estimate for the first five years of operation. The following sections discuss funding options and recommend next steps if Winchester decides to launch a bike share program.

Suitability Analysis

EPR, P.C. conducted a bike share suitability analysis to identify the areas of Winchester that are most appropriate for a bike share system. This analysis considers seven factors, related to bike share demand, to identify areas where there is likely to be the highest demand for bike trips.

Project staff divided Winchester into a grid of half-mile area hexagons and calculated a suitability score for each cell. The suitability score is the sum of the seven individual factor scores. Table 3 shows the weight of each suitability factor.

Suitability Factors

TABLE 3 SUITABILITY ANALYSIS FACTOR WEIGHTS

Suitability Factor	Weight
Population Density	30%
Employment Density	20%
Proximity to Parks, Major Destinations	10%
Bike Network Density	20%
Overlap with Green Circle Trail	10%
Proximity to Bus Stops	5%
Average Slope	5%
Total	**100%**

Population Density

Population density strongly correlates with demand for non-automobile trip making and bike share use. Demographic analysis sourced the American Community Survey 5-year 2014-18 population estimates at the Census block group level. Project staff distributed the block group population totals down to the parcel level based on the number of dwelling units located at each parcel. The estimated parcel populations were then joined proportionally to the hexagonal grid and a population density score was assigned to each cell.

Employment Density

Employment density is another factor that influences bike share demand. EPR, P.C. downloaded total employment estimates for Winchester at the Census block level from the Census' Longitudinal Employer-Household Dynamics program. Block-level employment estimates were joined proportionally to the hexagonal grid. Some manual adjustments occurred to correct for known data issues related to large employers with multiple work sites.

Proximity to Parks and Major Destinations

EPR, P.C. created a list of important destinations within Winchester that are believed to be attractive destinations for bike trips. These destinations include parks, the visitor's center, museums, historical sites, the downtown pedestrian mall, Winchester Medical Center, and Shenandoah University. Each cell of the hexagonal grid was assigned a score based on the total number of attractions located within that cell.

Bike Network Density

People are more likely to take a trip by bike if safe and comfortable bike facilities are available. EPR, P.C. created a map of existing bike facilities in Winchester based on VDOT and City of Winchester GIS data. Winchester staff reviewed this map and provided information about additional bike facilities to add to the map. Each grid cell was assigned a score based on the total length of bike facilities located within that cell.

Green Circle Trail

The Green Circle Trail is an important focal point for a potential Winchester bike share system. Although work to complete the trail is ongoing, the City has made investments in building out trail segments, branding the trail, and installing consistent wayfinding along the trail alignment. Grid cells that contain a portion of the Green Circle Trail were assigned suitability points.

Proximity to Bus Stops

Research indicates a symbiotic relationship between bike share and public transit. Transit riders are more likely to use bike share for some portion of their trip than are motorists. Although transit use is relatively low in Winchester, bus riders are an important potential market for bike share in the City. Each grid cell was assigned points based on the number of bus stops located within that cell.

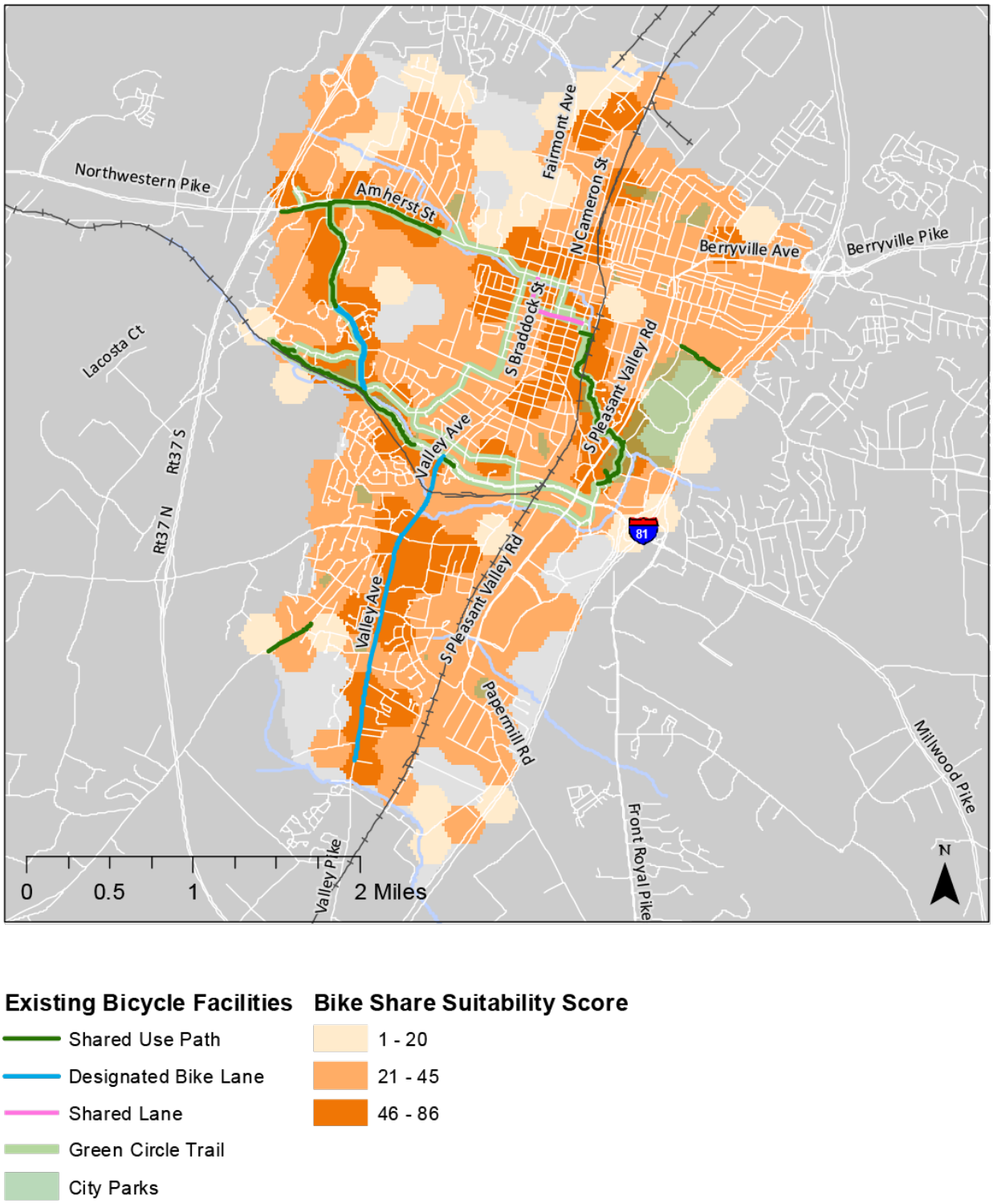
Average Slope

Hilly terrain is a known impediment to traveling by bike. The geographic profile of bike share trips in hilly regions is significantly shaped by slope because many bike share users prefer not to bike up hills. EPR, P.C. used a digital elevation model to calculate the average slope of each hexagonal grid cell. Cells with a low average slope were assigned more suitability points than cells with higher slope.

Results

The suitability formula resulted in a total score that is the sum of the seven individual factor scores. The result of this analysis is illustrated by the map in Figure 14.

FIGURE 14 MAP OF SUITABILITY ANALYSIS RESULTS



One way that this analysis is useful is that it identifies cluster locations within the city where there is likely high demand for bike share trips.

Old Town to Shenandoah University

The most prominent cluster is the area composed of Old Town and extending Southeast along the Green Circle Trail to Jim Barnett Park and Shenandoah University. This area is relatively dense, boasts several prominent attractions, and contains a completed segment of the Green Circle Trail.

Green Circle Trail Western Crescent

Another area with favorable conditions for bike share is the crescent-shaped area along the western edge of the Green Circle Trail made up of Amherst Street, Meadow Branch Avenue, Jubal Early Drive, and the Abrams Creek Wetlands Preserve trail. This area provides several miles of off-road bike paths, connections to several neighborhoods, and is anchored by the Winchester Medical Center and the Museum of the Shenandoah Valley.

Valley Avenue

A third area with favorable bike share conditions is Valley Avenue extending through the southern neighborhoods of Winchester. Valley Avenue is a commercial corridor that passes through several residential neighborhoods, providing good trip-making potential for bike share. Valley Avenue carries US Route 11 through Winchester and has two lanes in each direction with conventional bike lanes. Novice bike riders may find this street to be an intimidating place to ride due to numerous curb cuts and relatively high traffic volumes.

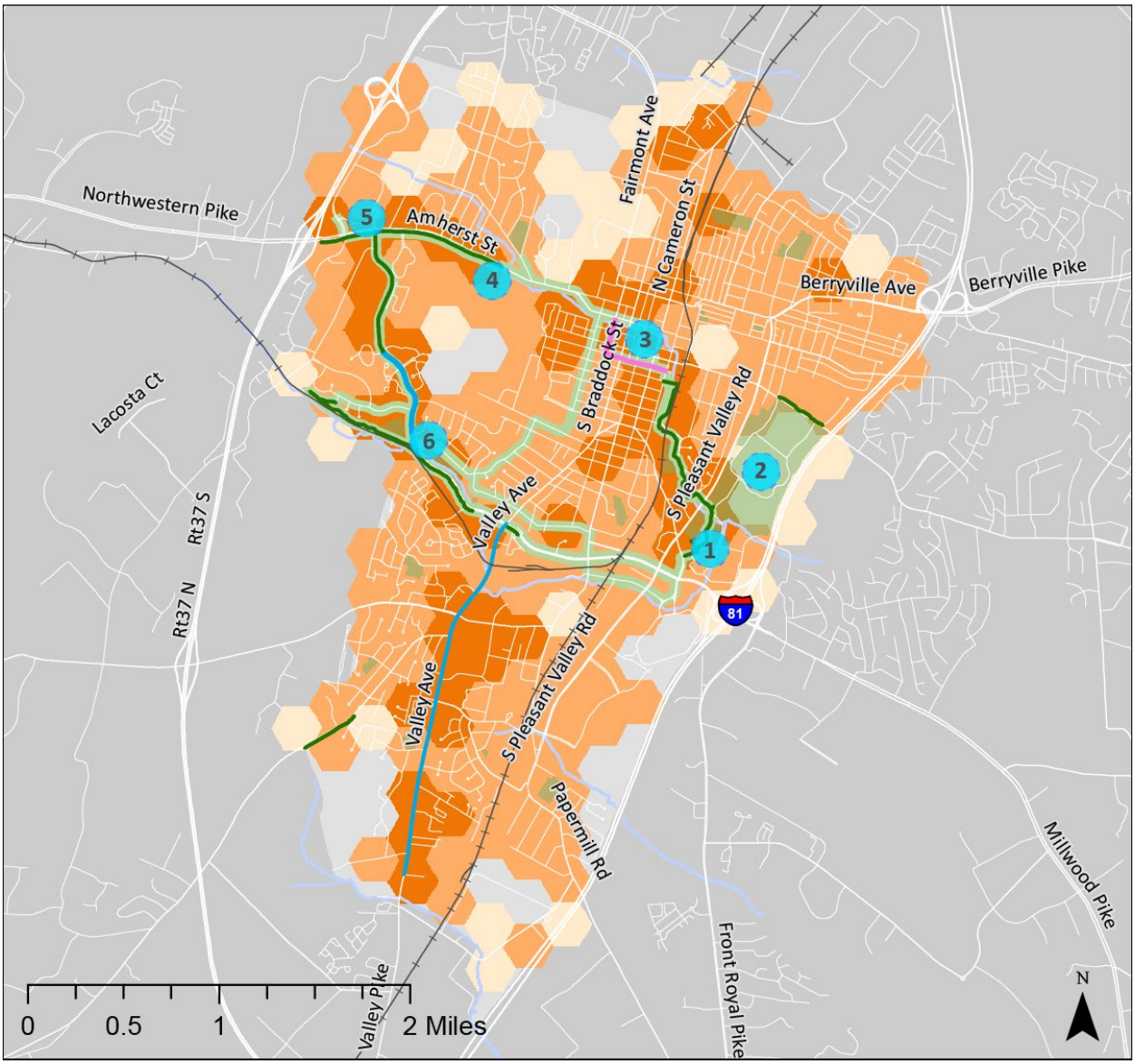
System Plan

EPR, P.C. developed a phased bike share system plan that will allow Winchester to implement the system gradually based on available funding and level of public support. Each phase specifies the total number of stations and bikes and identifies the general location of each station. The City should identify the precise station location based on factors including roadway conditions, sidewalk width, location of sidewalk obstructions, and property ownership.

Phase 1

The first phase includes six total bike share stations. Five stations are located along the Green Circle Trail and one in Jim Barnett Park. These proposed stations are within areas that ranked the highest in the suitability analysis and are strategically located at natural entry points to the Green Circle Trail. Figure 15 below shows the location of each proposed station.

FIGURE 15 PHASE 1 BIKE SHARE PLAN MAP



Existing Bicycle Facilities

- Shared Use Path
- Designated Bike Lane
- Shared Lane
- Green Circle Trail
- City Parks

Bike Share Suitability Score

- 1 - 20
- 21 - 45
- 46 - 86
- Bike Share Station - Phase 1

Phase 1 Stations

The six bike share stations in phase 1 are listed below along with a number corresponding to their location on the map in Figure 15.

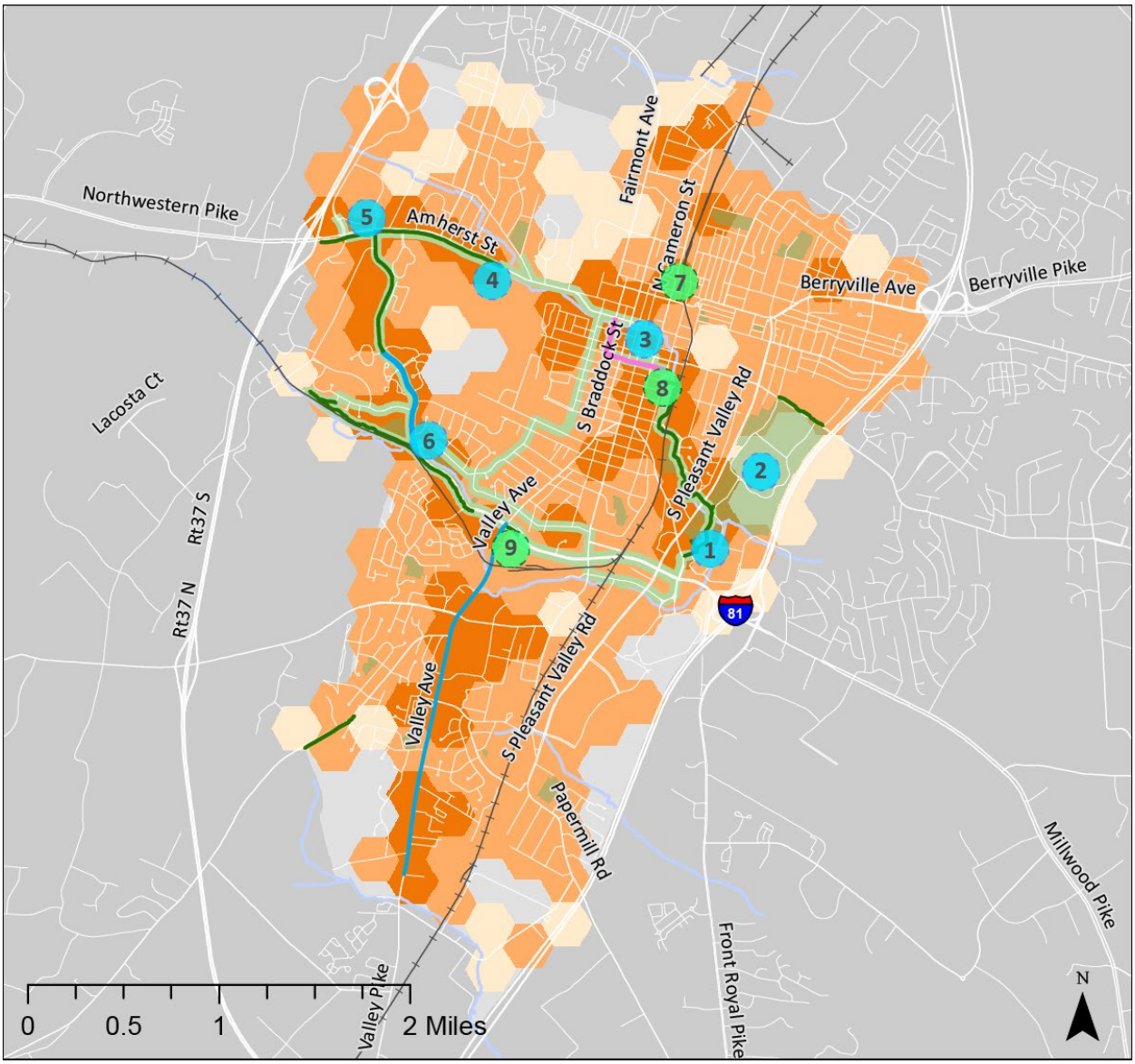
1. Winchester Frederick County Visitors Center and Shenandoah University
2. Jim Barnett Park
3. Old Town / Pedestrian Mall
4. Museum of the Shenandoah Valley – Amherst Street
5. Winchester Medical Center
6. Abrams Creek Wetlands – Jubal Early Drive

Based on a review of peer localities and bike share best practices for small systems, EPR, P.C. recommends a bike share fleet of around five bikes per station. Applying this rule of thumb to phase 1, we recommend 30 bikes.

Phase 2

Phase 2 introduces three additional stations to the area around the Green Circle Trail and Old Town. Research suggests high station density is a significant contributor to bike shares convenience and usefulness to users. For that reason, we recommend reinforcing the bike share system in the central areas with high suitability scores before expanding to residential areas. The phase 2 stations are shown in Figure 16.

FIGURE 16 PHASE 2 BIKE SHARE PLAN MAP



Phase 2 Stations

The recommended phase 2 station are:

7. Old Town North

8. Green Circle Trail Entrance – Kent St
9. Jubal Early Drive and Valley Avenue

Based on the suggested standard of five bikes per station, phase 2 will require 15 additional bikes.

Phase 3

The third and final phase of expansion outlined in this report is a modest expansion to residential areas within biking distance of the Green Circle Trail. Ideally, this expansion will follow or coincide with the provision of new bicycle facilities connecting residential areas to the Green Circle Trail. The suitability analysis highlighted several residential areas that are good candidates for bike share, but it will be most effective for bike share expansion to follow expansion of the bike network. For that reason, phase 3 station locations are not currently identified. Phase three assumes the same level of growth as phase two and will add three new stations and 15 additional bikes.

Equity Analysis

In many regions, bike share systems are established in higher-income districts to maximize market demand for bike share services. It is important to consider social equity when planning a bike share system to ensure all population groups can benefit from the system. EPR, P.C. conducted an equity analysis to determine the impact of this plan on groups that are often excluded or underrepresented in transportation planning processes.

The equity analysis considered the following population characteristics:

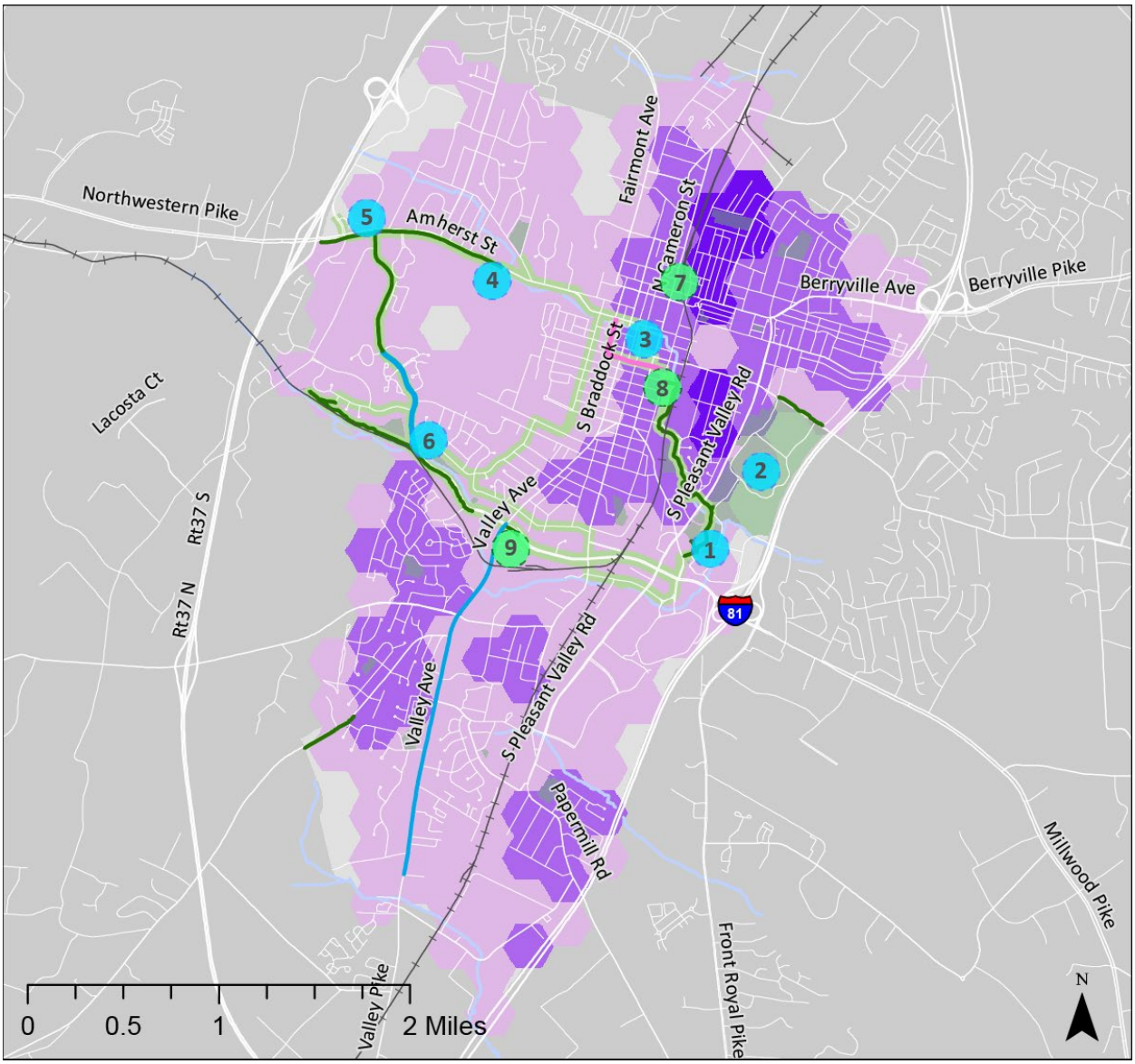
- Minority status
- Poverty status
- Limited English proficiency

The Census Bureau collects data on these variables through the American Community Survey. These data were downloaded at the block group level and joined to the same half-mile hexagonal grid used in the suitability analysis. Each grid cell was assigned an equity score based on the number of individuals and/or households that belong to the three focus populations. Figure 17 displays a map of the proposed bike share system with the results of the equity analysis.

Results

The area with the highest concentration of underrepresented groups is in the Northeast quadrant of the city. Much of this area would be served by Phase 1 and 2 stations. However, the densest concentration of such groups is in a residential neighborhood north of the bike share service area. Winchester should consider prioritizing this neighborhood in future bicycle infrastructure projects and in Phase 3 expansion of the proposed bike share system.

FIGURE 17 MAP OF EQUITY ANALYSIS RESULTS



Existing Bicycle Facilities
- Shared Use Path
- Designated Bike Lane
- Shared Lane
- Green Circle Trail
- City Parks

Equity Score
- 0 - 41
- 42 - 133
- 134 - 338
- Bike Share Station - Phase 1
- Bike Share Station - Phase 2

Business Plan

Operating Model

Bike share systems operate under a wide variety of ownership and operating models, including public, non-profit, and for-profit ownership and operation. After reviewing current best practices and

interviewing staff in Winchester's peer bike share localities, we recommend Winchester pursue contracting with a private bike share operator to launch and operate Winchester's bike share system. This approach has several advantages, including

- Limited impact to City staff resources,
- Budget certainty (costs are set before program launch),
- Limited public liability for theft, maintenance issues, and
- Access to latest bike and station technology.

In recent years, many smaller cities and towns have opted to contract with private bike share operators, and we believe this is the best approach for Winchester.

Technology

Payment and locking methods are two critical technological capabilities to bike share systems. While most big city bike share programs use systems that place payment and locking mechanisms in large, fixed stations, nearly all mid to small localities rely on systems that locate this technology on the bikes. These "smart bike" systems avoid the need for docking stations with large footprints and a need for electric and communications connections. EPR, P.C. recommend Winchester use smart bikes with built-in locking and payment mechanisms.

Cost Estimate

EPR, P.C. has developed cost estimates for both capital and operating expenses of a bike share system. These estimates are based on costs from Winchester's peer bike share localities and assumes Winchester will purchase and own the station infrastructure (bike racks and information panels) and lease bikes from a private bike share operator. This cost estimate includes a 10% contingency to account for unknown factors.

The cost estimate assumes the system is phased in with expansion every two years, but this timeline is only a suggestion. Winchester should determine when to expand and how large the system should be. Table 4 provides a breakdown of estimated costs for the first five years of system operation.

TABLE 4 FIVE YEAR COST ESTIMATE

		Phase 1 Year 1		Year 2		Phase 2 Year 3		Year 4		Phase 3 Year 5	
	Unit Cost	#	Cost	#	Cost	#	Cost	#	Cost	#	Cost
Conventional Bikes	$1,440	30	$43,200	30	$43,200	45	$64,800	45	$64,800	60	$86,400
Bike Racks	$450	53	$23,850	0	$0	27	$12,150	0	$ 0	27	$12,150
Information Panels	$1,000	6	$6,000	0	$0	3	$3,000	0	$0	3	$3,000
10% Contingency			$7,305		$4,320		$7,995		$6,480		$10,155
Total			**$80,355**		**$47,520**		**$87,945**		**$71,280**		**$111,705**

Stations Costs

Bike share stations in smaller localities typically include bike racks and an information panel that displays a map and other important system information. It is important to provide more bike racks than the total

number of bikes so that there are available racks for users to return their bikes at any station they choose. Based on the ratio of racks to bikes of Winchester's peer bike share localities, we recommend Winchester provide approximately 1.75 racks per bike. The number of racks at each station may vary based on demand but this rule of thumb will give users confidence that they will be able to return their bike at the end of their trip. Station costs are fixed but do not account for maintenance or depreciation. Bike racks are durable and do not require extensive maintenance, but information panels are vulnerable to vandalism and may need to be modified as the system expands.

Bike Costs

Peer city research indicates it is common practice for smaller cities like Winchester to lease bikes from private bike share operators rather than purchase them outright. In this arrangement, the city and a bike share operator negotiate a fixed annual cost per bike that includes maintenance and end-of-life replacement. Under this model, there is no start-up or capital costs associated with each bike.

Vandalism is a significant contributor to bike maintenance and replacement costs in some of Winchester's peer bike share cities. Although leasing bikes from a private bike share operator shifts the short-term responsibility for replacing bikes away from the City, high rates of vandalism will likely lead to an increase in costs when the bike share contract is renewed. Therefore, it is in the City's interest to reduce vandalism as much as possible. Winchester can reduce vandalism by

- Conducting meaningful public engagement to encourage a sense of community ownership of the system,
- Placing stations in highly visible areas,
- Installing high-quality bike racks at stations, and
- Educating local police about proper and improper uses of the system.

Funding Options

The City of Winchester has four potential revenue streams for starting and maintaining a bike share system. Revenue approach varies depending on the funding needs and the City's overall system goals. Funding options include local budgets (capital and operating), grants, sponsorships, and user fees. This report recommends a combination of funding sources for a sustainable system.

Local Budgets

The City has the option of using the Capital Improvements Program (CIP) for startup and subsequent capital costs. The City's operating budget can finance other recurring and maintenance costs. Local budgets are the most certain approach for funding, as the City has direct decision-making authority. Most grant funding requires documentation for why the locality cannot finance the system with other local and state funding. Consequently, the City should document funding decisions and budgets.

Grant Funding

The Virginia Department of Rail and Public Transportation (DRPT) offers grant funding for system startup. Details on this funding source are provided in the FY2021 Grant Program Application Guidance. DRPT offers a technical assistance grant described in the callout box. Bike share is ineligible for the TDM Operating Assistance Program. The Blacksburg system used DRPT funds to start their system but relies on other funding for program operation. A common challenge for systems is to be awarded grants funds for startup, without a plan for ongoing maintenance and operation. One example is the UBike program at the

University of Virginia, which received DRPT startup funds but eventually dissolved the system partially due to the lack of a long-term funding strategy.

DRPT Bike Share Program Start-Up Assistance Guidance

In certain situations, and only after planning and preparation have occurred, a Technical Assistance grant may be used to start a bike share program. DRPT's program managers are available to assist with the process of a bike share program development and funding application requirements to ensure the applicant has met the conditions needed to apply for funding.

- Technical Assistance funding for bike share programs are not available in areas where CMAQ funding is available, as CMAQ may be used to start a bike share program.
- Potential applicants must attempt to obtain all other applicable state and federal funding before applying for Technical Assistance and provide documentation of the exploration of other funding with the application.
- Before applying for funding, the applicant must have conducted research or a feasibility study to determine if a bike share program is viable, the optimal type of bike share program that should be implemented, optimal locations of bikes, optimal number of bikes, and identified and received local funding support.
- All research and feasibility studies must accompany an application for funding to start a new bike share program.

Sponsorships

Sponsorships and other partnerships are critical elements to a robust bike share system. The City should work with lodging businesses, employers, the University, and other groups to secure funding and participation in the system. One approach is to offer a bike station in front of a participating business or organization, in exchange for a sponsorship. Signs and other displays can identify sponsors that helped to make the system possible. The City should develop a sponsorship package that communicates the benefits of participation. This effort will require administrative costs for annual contact with sponsors, management of funds and agreements, and development of sponsorship packages.

User Fees

While user fees are an important tool for maintaining the bike share system, bike share generally requires subsidies through other revenue sources. Assuming ridership rates, the managing department should set a reasonable user fee and budget, in coordination with other revenue streams. The Bike Share Task Force described in the next chapter of this report should provide guidance on setting appropriate user fees.

Next Steps

EPR, P.C. has developed the following recommendations for next steps if Winchester chooses to proceed with establishing a bike share system.

Designate a Responsible Party

The City and MPO should designate the party ultimately responsible for the bike share system. Although it is best to establish public-private partnerships to support bike share, it is important to name a City department or other agency as the entity responsible for making final decisions about the bike share system.

Establish a Bike Share Task Force

Winchester should establish a bike share task force chaired by a staff person from the City department that will take primary responsibility for the bike share system. This task force should be composed of a small group of community stakeholders, including residents, local businesses, non-profit organizations, and educational and medical institutions. This group will guide City staff in making key decisions and establishing partnerships that will ensure the success of the bike share system. It is important to designate an organization or department that is ultimately responsible for the bike share system, but a community task force can provide critical information and solidify public support for bike share in Winchester.

Community Engagement

The task force will play an important role in distributing information about bike share to the community and providing feedback to the City. If bike share is to be successful, it is important that the community understands what bike share means for Winchester and can provide information to the City. The task force will ensure community desires are incorporated into the new bike share system.

Partnerships and Sponsorships

The task force will be responsible for identifying opportunities for local partnerships and approaching potential sponsors to request financial support. It is important to include representatives from local businesses on the task force so that the City can form meaningful partnerships with local businesses.

Station Siting

The task force will advise the City on the citing of bike share stations. Community members have useful knowledge of foot traffic patterns, walking and biking routes, and street and sidewalk use that will help the City locate stations in the best possible locations. The City is ultimately responsible for determining precise station locations but should solicit feedback from the bike share task force.

System Maintenance

After system launch, the task force should meet periodically to provide information about system performance to the department responsible for overseeing bike share. The task force can provide feedback on issues and problems related to maintenance, vandalism, safety, and station location. For example, if a bike share station is not seeing much use, the task force may be able to tell the City why the location is not working and suggest a better site.

System Expansion

The task force will advise the City on each phase of expansion. This is particularly important for Phase 3 which does not have defined station locations.

In summary, the task force can play an important role in ensuring the public has a sense of ownership of the bike share system and those responsible for overseeing the system have access to the best possible local information.

Obtain Funding

The City should pursue funding for start-up and continued operation of the system. Although grant funding may be available for system start-up costs, it will likely not cover the annual operating cost of the system. Operating expenses will need to be covered by user fees, sponsorships, and other local funding. The City should engage local elected officials to determine whether there is sufficient support for bike share to guarantee its long-term viability. This work should coincide with the work of the task force so that potential sources of private funding (such as sponsorships) can be accounted for when determining how much public funding will be necessary.

The City department or organization that will oversee bike share should apply for grant funding as soon as possible. Launching bike share will likely require funding from multiple sources so it is important to pursue all potential funding sources at the same time.

Choose Bike Share Operator

The party that is ultimately responsible for the bike share system should develop a Request for Proposals (RFP) for a bike share operator to launch and operate Winchester's bike share system. The RFP should be written in such a way to provide flexibility and ensure as many respondents as possible. Winchester could reach out to peers in other small bike share cities and request a copy of the RFPs they used to solicit bids from bike share companies. Assuming funding has been secured, Winchester will choose a bike share operator, award a contract, and oversee the implementation of the bike share system.

Conclusion

This study finds that bike share is feasible in Winchester if the program is supported by the community, key business stakeholders, and the City. A bike share system will require startup funding support and a reliable source of operations revenue to ensure long-term success.

This study recommends that Winchester

- Adopt an All Ages and Abilities policy for bicycle network planning and design,
- Complete the Green Circle Trail with off-street or physically separated paths,
- Designate an agency or organization as the party responsible for bike share,
- Establish a bike share task force composed of City staff and community stakeholders to pursue sponsorships and advise the responsible party on key decisions,
- Pursue multiple funding sources for startup and operation costs, including grants, capital improvement programs, and local budgets, and
- Issue a request for proposals (RFP) for the operation of the bike share system and choose an operator

Appendix A: Survey Results

The survey included 10 multiple-choice questions and a map feedback tool. The survey questions are listed below along with the multiple-choice options and the total number of respondents who selected each option.

Which forms of transportation do you currently use to perform daily tasks? (commute to work, dr. appointments, running errands, etc.) Select all that apply. **266 responses.**

- Personal Vehicle **(144)**
- Public Transit **(6)**
- Bicycle **(31)**
- Walk **(71)**
- Carpool **(11)**
- Other **(3)**

How often do you ride a bike? **152 responses.**

- Daily **(10)**
- Weekly **(29)**
- Occasionally **(65)**
- Never **(48)**

What kind of trips do you currently take on a bike? Select all that apply. **152 responses.**

- Recreation **(103)**
- Work or school **(15)**
- Shopping, errands, appointments **(21)**
- Other **(13)**

Do you currently own a car or a bike? **145 total responses.**

- Neither **(3)**
- Yes, a car and a bike **(78)**
- Yes, a car but no bike **(64)**

Are you aware of the existing bicycle friendly paths connecting areas of the City (e.g., the Green Circle Trail)? **144 responses.**

- Yes **(124)**
- No **(20)**

Have you ever used a bike share system in another city? **143 responses.**

- Yes **(61)**
- No **(82)**

If a bike share system existed in the City, which would be the most likely reason you'd use one**? 143 responses.**

- Trips to work or class **(15)**
- Shopping, errands, appointments **(18)**
- Connect to public transportation **(3)**
- Recreation / leisure **(81)**
- None **(26)**

How often would you be likely to use bike share? **141 responses.**

- Weekly **(37)**
- Monthly **(64)**
- Daily **(5)**
- Never **(35)**

If available, what would be your motivation to use bike share? (Check all that apply) **371 responses.**

- Saving money on transportation **(23)**
- Recreation **(81)**
- Physical health **(98)**
- Helps the environment **(78)**
- Convenient one way travel **(53)**
- Commute to work **(11)**
- None **(21)**

Dockless vs. Docked Systems

If available, what types of bike share features would you most like to see? Select all that apply. **424 total responses.**

- Membership cards **(31)**
- Mobile apps **(99)**
- Website access **(42)**
- Kiosk access **(64)**
- Cash payment options **(32)**
- Designated docking stations **(70)**
- Ability to reserve or hold a bike **(86)**